Issued Weekly by the
Hill Publishing Company
JOHN A. HILL, Pres. ROB'T MCKEAN, Secy.
505 Pearl St., New York.

Monadnock Bldg., Chicago.
6 Bouverie Street, London, E. C.
Unter den Linden 71—Berlin N. W. 7.

WALTER RENTON INGALLS, Editor.

Subscriptions payable in advance, $5.00 a year for 52 numbers, including postage in the United States, Mexico, Cuba, Porto Rico, Hawaii, or the Philippines, $6.50 in Canada.

To foreign countries, including postage, $8.00 or its equivalent, 33 shillings: 33 marks: or 40 francs.

Notice to discontinue should be written to the New York Office in every instance.

Advertising copy should reach New York Office by Thursday of week before date of issue.

Entered at New York Post Office as mail matter of the second class.

Cable Address, Engmnjour, N. Y.

CIRCULATION STATEMENT

Of this issue 10,000 copies are printed.

None sent free regularly, no returns from news companies, no back numbers. Figures are live, net circulation.

Contents

	Page
A Movement in Silver	431
Alarm in Sonora	431
Competition in Sulphur	432
A Field for Improvements	432
The Lead Market	432
By the Way	433
Correspondence and Discussion: Byproduct Coke Ovens .... Food Supplies for Miners....Cyaniding Troubles and Remedies....The Ton	434
Lake Superior Institute Meeting	435
August Mining Dividends	436
*Caving System in Chisholm District—I.....L. D. Davenport	437
Normal and Reverse Faults	439
Railway Routes in Alaska	439
Chronology of Mining for August, 1912	440
International Congress of Applied Chemistry	440
International Association for Testing Materials	440
Investigating Alaska Coal Field	440
Trouble in Mexico	440
Details of Practical Mining: *Powder Chutes for Open Pits.... *Drift Round in Flat Sediments ....*Setting Out Underground Work	441
Details of Metallurgical Practice: *Mercury Trap for Amalgamation Tables .... *Car for Mechanical Haulage....Governing a Hydro-Electric Generator .... *Replacing a Tube Header .... *Measuring Small Quantities of Low Pressure Air....*An Under-Water Bearing ....*Laboratory Apparatus for Thiogen Process Tests....Lubricants and Lubricating....*Device for Removing Chips from Ore.... Grinding Samples for Assay	443
*A New Sulphur Operation in the South.....Richard H. Vail	449
Aluminum in France	453
Mines in the Mogollon District, New Mexico.....W. Weston	454
Universal Chemical Co	454
Sulphuric Acid Strengths	454
Costs at the Erie Mine. S. H. Brockunier	455
Gold Production of Seward Peninsula	456
*Historical Sketch of Ocampo Mines. Robert Linton	457
Mineral Output of New Caledonia	458
*The West Sintering Process	459
Greenside Mine, England	460
*Platinum Electrodes of Light Weight	461
Mining Index	467
Personal, Obituary and Societies	466
Editorial Correspondence	467
Mining News	469
Markets	469

*Illustrated.

The Engineering and Mining Journal

Vol. 94. SEPTEMBER 7, 1912 No. 10

A Movement in Silver

Silver is now selling at the highest price reported since 1907, the recent advances having been due in part to speculative activity, and in part to an actual demand for the metal from India, and to the probable increase in the demand for China. The speculative activity has been based largely on the belief that the Indian Government would soon be obliged to buy largely for coinage purposes, the reserve of silver rupees having been drawn down to a point which seemed low in view of the probable demand for money to pay for the good crops of the present year.

This anticipation has proved to be correct, but the result has not been altogether pleasing to the powerful group of Eastern speculators which has been carrying heavy stocks of silver in London and in India for some time. It now appears that the Indian Government, with unusual shrewdness, had been anticipating its needs and had been buying silver quietly on the open market for some time. There were some suspicions as to its action, but the fact was not fully known or accepted until a week ago, when the steamers to Bombay and Calcutta carried out shipments amounting to £750,000—about 6,050,000 oz.—on government account. It is understood in London also that further large shipments will be made soon. This movement has caused some surprise, but it has entirely frustrated an attempt by the Indian speculators to corner the market and force the government to pay a high price for the silver it needed.

There need be no surprise at the action of the India Council, since the supplies of silver on the market have been sufficient for all needs. It is evident that the government had no difficulty in buying all it needed without outside assistance. The only surprising point is that the purchases were carried out so quietly, and that there was no leakage of information, for which the Indian syndicate was so anxious.

What is to become of the heavy stocks carried by the Syndicate is rather an interesting problem. The supply of the metal is larger than any speculative group can gather in, as has been shown by the result, and it is likely to be increased by the fact that Chinese banks are just now inclined to be sellers rather than buyers. It looks very much as if the Syndicate would suffer, now that it has missed the point for which it has waited so long.

Alarm in Sonora

The most alarming news of the Mexican insurrection, in so far as American mining interests are concerned, has come during the last week from northern Sonora, where three important mining places have been involved. El Tigre was threatened, but the attack was averted by the determined show of resistance by the Americans there. Guerrilla fighting has been going on in the vicinity of Nacozari, and the situation at Cananea, with which communication has been cut off, is described as grave. The trouble in this part of Mexico arises from the marauding of remnants of Orozco's army, which in bands of some hundreds each are scouring the country for plunder like some bandit parties of earlier days in Mexico. About the only difference now is that there are more of them, but of political purpose there is no more now than then. Having exhausted the resources of the native ranches, they now look with cupidity upon the possessions of American miners and will take them if they dare.

It is chiefly a question of the number of Americans at any one place to resist. These Americans may have nothing whereof to complain to this country, having gone into Mexico with the knowledge that they were entrusting their lives and money to the conditions of a turbulent, foreign land, but, of course, they have the sympathy of us all and they are so near the border that it is easily conceivable that armed assistance may be rend-

ered and that international complications may easily arise. The events at Cananea a few years ago, when volunteers from Arizona rushed to the scene, are fresh in mind.

Competition in Sulphur

The success of the plans to operate a sulphur-bearing "dome" on the Texas coast, about 40 miles southwest of Galveston, will alter the unique position that the Union Sulphur Co. has occupied for about 10 years in the sulphur industry of this country. The geologic features surrounding the Texas deposit are supposed to be almost identical with those at Sulphur, La., and while lying at greater depth, the Bryan Heights dome owned by the Freeport Sulphur Co., has the advantage of being nearer to tidewater and of having a larger sulphur-bearing area, which careful drilling has indicated to contain a deposit of sulphur running into millions of tons. A production from this property at the rate of the present Louisiana output would be likely to disturb the market for this mineral.

The Freeport Sulphur Co. is now completing its initial plant on Bryan Heights, but it must still demonstrate that it can use the Frasch process, both physically and legally. This process, though simple in principle, required the solution of important practical details to make it an operating success. However, with the capital and brains behind the Texas enterprise, there seems little doubt that all legal and operating difficulties will be eventually solved.

Since 1903, the Union Sulphur Co. has had the American field practically to itself and has enabled Mr. Frasch to reap a richly deserved reward, the price of sulphur having been maintained at about the former figures of $20@22 per ton by agreement with the Italian *consorzio*, which desired to protect the Sicilian miners from an invasion of American sulphur in Europe.

The Texas company may experience a period full of the initial difficulties incident to any new operation but, assuming that it will not be required to pay royalty for the use of the Frasch process, there would seem to be little doubt of the ability of the Freeport Sulphur Co. to compete in the open market with the Louisiana producer.

These two companies will, on the basis of present estimates, be able to supply more than the present requirements of the American market. The question then arises as to whether a price war will ensue or whether the two interests will come to an amicable agreement as to how the market shall be distributed and extended.

Assuming commercial competition between the two companies, the Texas operation will have a far-reaching effect upon the sulphur industry, both directly and indirectly; directly, in the possibility of reduced prices for sulphur and its more extended use in the industries; indirectly, the new operation will be a stimulus to the exploration of other domes of the Gulf Coastal Plain, and even though the present operation should not be competitive, the development of other deposits will eventually bring the production of sulphur to a competitive basis. Just now the world seems much interested in sulphur; the daily press, even, has during the last few months been full of announcements of sulphur explorations in various countries. Important changes are undoubtedly in prospect in this industry, but the development, equipment and marketing of a large tonnage of sulphur is not an operation that may be instituted at short notice nor undertaken with small capital.

A Field for Improvement

The wide application of the cyanide process has naturally had a strong tendency toward improvement of details of procedure. Almost every operation connected with the process has had the attention of specialists bent on bettering every detail of the work. In spite of all this effort there still remains one detail that has resisted the efforts of improvers. We refer to the melting of the precipitate, the final step in the process of putting into the form of bullion the metals contained in the ores. The method of melting the precipitate differs, at the present time, very little from what was used in the first mills built for cyaniding.

Variations have been proposed and some of them have been tried sufficiently to justify the claims made for them. A noteworthy example is the treatment devised some years ago by P. S. Taverner, of South Africa. In this process the precipitate is melted in a reverberatory furnace with litharge, the result being a lead bullion carrying the precious metals. This bullion is subsequently cupelled in an appropriate furnace, leaving a clean, high-grade product. The process is, in fact, a magnified assay. The method indicated that great savings were possible, yet one hears little of the process now. The tilting, oil-fired furnace is a development of recent years, but users now are claiming that it offers no advantages either in cost or ease of manipulation. The electric furnace seems to have worked well at Lluvia de Oro, but few mines are so favorably situated with respect to cheap and excessive electric power.

The operation is crying for improvement, a statement that may be proved by questioning anyone in charge of such work. The physical hardship of working about the hot, inconvenient furnace now in use, is evident to anyone acquainted with cyaniding. Beside, the operation is wasteful, unduly protracted and costly. The field is open and an improvement will be welcomed.

The Lead Market

With lead selling in Europe in the neighborhood of 4.50c. per lb. and in New York at about the same price, we experienced a condition that has not previously prevailed for many decades. No wonder the leading American interests had to raise their price. If they hadn't, the pesky foreigners might have been buying some of our lead.

The reason for the remarkable rise in Europe is undoubtedly to be found in an excellent demand and a halting supply. No noteworthy new sources of lead have been developed in a long time, while the consumption of lead is increasing constantly.

The present condition of the markets may convince American lead miners that a reduction of the tariff on lead may not be such a dreadful thing after all, but probably it will not alter their demand for its maintenance, because even if the European price should continue to run close to the American, the tariff will always exclude the foreign product, while we shall be free to export the domestic when we want to get rid of a surplus, just as in the case of spelter.

The stock of the Alaska Gold Mines Co. recently offered to the public was greatly over subscribed, showing that there is plenty of money available for mining issues in which there is confidence.

By the Way

Commenting on the "sootability" of Pittsburgh, *Graphite* says that 40% of the dust in that city is soot, and that its citizens wear plain black soots, with stripes when it rains.

Melting cyanide precipitate is not a pleasant occupation at best, but some ways of doing it are more unpleasant than others. One operator refers to the oil-fired furnace as an "all-fired" nuisance.

Prof. Henry M. Howe, in welcoming the delegates to the International Congress of Testing Materials, addressed the representatives of each country separately, first greeting the Germans and Frenchmen in a few words in their own languages. When he came to Russia, Scandinavia, and the Oriental nations, he returned to English, but the delegates from Hungary, Italy, and Spain were welcomed in their respective tongues.

Sept. 4 was the thirtieth anniversary of the beginning of commercial incandescent lighting. On Sept. 4, 1882, Thomas A. Edison started in operation the world's first central station. At three o'clock in the afternoon, in an old brick building, a converted warehouse, in lower Pearl St., New York, steam was turned into a single dynamo and current was sent through underground cables into about 400 lamps distributed throughout a territory of a square mile, bounded by Wall, Spruce and Nassau Streets, and the East River.

The remarkable industrial expansion in Germany has been partly responsible for the great consumptive demand for the metals, but there are signs that there may be a check to this. Capital is undoubtedly under a great strain in Germany and there are fears that an unpleasant interruption may be impending. Words of warning have been uttered by such authorities as the presidents of the Reichsbank and of the Deutsche Bank. Many persons in Germany are regarding these as cassandran or merely amusing, but from this distance they will be regarded with due seriousnes, especially as it is known privately that the situation in Germany is viewed with concern among financial circles.

"In my youthful days," said a distinguished mining engineer, "I wrote elaborate and lengthy reports, of which I was very proud. Some of them were excellent treatises on engineering subjects. But my pride had a fall when I found that my clients never read them. This developed during one of the usual interviews when I was asked to summarize verbally my opinions. At the same time I learned that all they wanted to know was how much the mine could pay per annum, how long it could pay and what it was worth. I thought they ought to want to know more, but appreciated that they didn't and ever afterward I governed myself accordingly." However, we do not think this is properly to be taken as advice. The engineer will best write a report in "telegraphese" for his clients and a full report for the information and criticism of other engineers if necessary.

A wireless-telegraph equipment capable of sending messages 2500 miles is being shipped to Fort Egbert, Alaska, by the United States Signal Service. This will be a 10-kw. set, one of the longest range wireless sets in use by the Government, and will be shipped in duplicate so that no serious interruptions to service will occur from the breakage of any part that could not be quickly replaced in the Alaskan wilds. Fort Egbert is at Eagle City near the head waters of the Yukon on the eastern boundary. There are other long-distance wireless stations at Fort Gibbon in central Alaska where the Tanana joins the Yukon, and at St. Michaels on the western coast, so that wireless communication will be possible at all times across the territory. The Homestake mine, in South Dakota, as well as some others, has wireless apparatus in use and an installation was, we understand, at one time considered at the Lucky Tigre mine in Sonora. With the distressing conditions now prevailing in Sonora, wireless sets at El Tigre, Nacozari, Cananea and other camps would be of great service in communicating the actual conditions to anxious friends.

Russian labor has been a subject much to the fore among engineers who have to do with operations in that country. The assassination of Horace H. Emerich at Kyshtim and the disturbing conditions at Lena Goldfields have caused many mine managers elsewhere to be quite satisfied with their operating conditions. That there is some docile and efficient labor in the Tsar's domain, however, is evidenced in a letter written by John Power Hutchins, who reports some remarkably cheap hand-washing of gravel in the Trans-Baikal country. Mr. Hutchins has just finished a series of examinations for the Cabinet of the Tsar in the Nertchinsk region, and sends a view of a typical gravel-washing plant in which the gravel is hand-loaded into horse carts and hauled to the plant. The coarse tailing is hauled away by other carts, and the fine tailing washed away by water in some plants, but in others it also is hauled to the dump by carts. "Not much chance here for dredges," remarks Mr. Hutchins, "with labor at 50 to 75c. per day, the total working cost is often only 30c. per cu.yd. in frozen ground."

And now a mining stock is to be dragged into the mire of the police-gambling scandal of New York. A youth, according to the *Times*, approached Lieutenant Becker's wife with a request for $260 and a letter containing an offer of valuable information and a mining-stock certificate which was to be collateral for the money advanced. The letter read: "Dear Mrs. Becker: Am unable to meet you today, but am sending a messenger to whom you can give the money. I am being followed and can't be too careful. I am inclosing a stock certificate of the Tonopah Mining Company which you can hold as collateral. Will bring two people to see you tomorrow evening at 8.10 p.m. I need the money badly—very badly—in order to carry out my plans. Do not lose the stock certificate as it is very valuable. A friend in haste. * * * * P. S.—These two people have something on Jack Rose which will be of great help to you in your trouble. (Signed) J. H. W." As a matter of fact, the stock certificate inclosed was for 500 shares of Tonopah Gold Mountain Mining Co.'s stock made out in the name of R. B. Frisbie. We believe there was such a company once, but the young man must have spoken truly when he wrote that he needed "the money badly—very badly."

Brokerage houses continue to be large holders of copper shares. The Boston *News Bureau* publishes a list of the largest shareholders in several Lake Superior companies on Dec. 31, 1911, from which the following are taken: In Hancock Consolidated Mining Co.: Paine, Webber & Co., 23,620 shares; St. Mary's Mineral Land Co., 20,000; John D. Ryan, 4750; Hornblower & Weeks, 3825; C. D. Autremont, Jr., Duluth, 2000; W. A. Paine, Boston, 2000; E. Ryan & Co., Calumet, 1900; Fitzgerald, Hubbard & Co., 1840; R. L. Day & Co., 1360; W. H. Thurston, Boston, 1285; Joseph Hoatson, Calumet, 1100; P. Roberts, Calumet, 1050; R. F. Berton, New York, 1000; C. A. Congdon, Duluth, 1000; W. E. Corey, New York, 1000; C. Head & Co., 1000; H. Oliver, Pittsburgh, 1000; C. J. Paine, Boston, 1000; G. E. Tenor, Pittsburgh, 1000; Hayden, Stone & Co., 980; N. F. Leopold, Chicago, 900; J. D. Cuddihy, Calumet, 637; J. L. Harris, Hancock, 600; C. D. Fraser, New York, 550; U. S. Trust Co., New York, 500. In Centennial Copper Co.: Calumet & Hecla, 43,440 shares; Paine, Webber & Co., 3806; C. E. Morey, trustee, Boston, 1200; Jackson & Curtis, 1110; Tucker, Hayes & Co., 1105; C. Briggs, Calumet, 1000; Lee, Higginson & Co., 895; Estabrook & Co., 850; J. R. Williston & Co., 790; Hayden, Stone & Co., 730; Hornblower & Weeks, 640; Fitzgerald, Hubbard & Co., 615; Parker-Morse Co., 610; E. W. Sparrow, New York, 600; Pearmain & Brooks, 565; Daniell Investment Co., Laurium, 550; Parkinson & Burr, 506; D. Hodgson, Montreal, 500; E. A. Kimball, Lynn, 500; F. H. Rice, Boston, 500; C. M. Turner, Lansing, 500 shares.

Correspondence and Discussion

Views, Suggestions and Experiences of Readers

Byproduct Coke Ovens

A list of byproduct coke ovens operating in the United States on Jan. 1, 1910, was given in the JOURNAL of Mar. 9, 1912, which I brought up to Jan. 1, 1911, in a letter in the JOURNAL of Apr. 20, 1912. It is now possible to revise this list to Jan. 1, 1912.

In addition to the list previously given, *Koppers* ovens have been erected at Joliet, Ill., by the Coal Products Manufacturing Co.; *Semet-Solvay* at Waukegan, Ill., by the North Shore Gas Co.; and at Cleveland, Ohio, by the Cleveland Furnace Co.; *United Otto* at Wyandotte, Mich., by the Michigan Alkali Co., and at Hamilton, Ohio, by the Hamilton Otto Coke Co.

These additional names I take from one of the Geological Survey bulletins.

H. J. MARTIN.

New York, Aug. 21, 1912.

Food Supplies for Miners

Prospecting extremely tight placer gravels at Las Quebradas, Guatemala, with an Empire drill, proved to be such heavy work that the native Guatemaltekan was utterly unequal to the task. Only the strongest American, Jamaican and Martinique negroes lasted more than a few weeks. To get and keep this class of labor, in an isolated camp, away from the attractions of the neighboring banana farms, it was necessary to offer better inducements than could be obtained elsewhere in the country. High wages proved to be little or no attraction as they only meant a few minutes longer in the gambling houses on pay day. After numerous experiments the mess was reorganized and the menu made to conform as far as possible to lines suggested by the men themselves.

The result of 14 weeks' operation, ending July 1, feeding on the average of 30 men, follows; the amounts given are the weekly consumption per man. Black beans, 1.4 lb.; plantain, 3 lb., approximately; ground provisions (sweet potatoes, cassava, etc.), 3 lb.; lard, 0.5 lb.; flour, 5.0 lb.; rice, 2.1 lb.; sugar, 1.3 lb.; coffee, 0.3 lb.; salt, 1.0 lb.; baking powder, 0.17 lb.; meat (beef), 10 to 15 lb. The meat is taken at live weight and much of the salt was used in preserving it. Immediately after killing the beef was cut from the bone, in long strips about 1½ to 2 in. wide and ½ in. thick, and placed in strong brine. After about two days it was hung on ropes in the sun and thoroughly dried, in this way the meat was kept as desired.

The unusually large proportion of beef may surprise the average North American who regards meat as a food to be eaten sparingly in the tropics. No bad effects were noted from its use, and on the contrary as soon as the news that all the meat desired was provided, no more trouble was experienced in getting and holding men. The local cost of live beef was between 3 and 4c. per pound. Circumstances forced the use of baking powder, which could be eliminated if yeast were available.

It is probable that the consumption of food per man would have been somewhat reduced had the operations extended over a longer period and a suitable, steady force of men picked out, as it was very apparent that when a man had been in camp for a few weeks and had been "fed up" his appetite approached the normal.

H. L. CARR.

New York, Sept. 3, 1912.

Cyaniding Troubles and Remedies

I have read with interest the article by Herbert A. Megraw on "Cyaniding Troubles and Remedies," in the JOURNAL for Aug. 17, 1912, and would respectfully call attention to a printer's error on page 311, third column, seventh line, where the word "cyanides" has been used in place of "cyanicides."

In the same column there is a statement which is puzzling me. It is as follows: "Where the whole product is reduced to such a point that it may be treated as a slime, that is, making a total slime product, the whole reducing system of operation must be carried out in water."

There must be an error of some kind in this statement or it must be capable of a different interpretation from the one I put on it, for in this camp and Pachuca, not to speak of others, I can mention a large number of mills that are treating an all-slime product and crushing and doing all the work of reduction in cyanide solution.

C. E. RHODES.

El Oro, Mexico, Aug. 24, 1912.

I have noted with interest the remarks of C. E. Rhodes with reference to my article in the JOURNAL of Aug. 17, 1912. In regard to the apparently untrue statement to which attention is called, I would like to say that this sentence was not intended to be read alone, but depends upon the general surrounding text, and in particular upon the preceding sentence where I said: "Grinding in water has some disadvantages which must be taken into account when such practice is under consideration."

The following sentence was intended to refer only to cases where part of the reducing operations were carried out in water, the conclusion being that in this case, all the grinding must be done in water. Perhaps it would have been better had I said that where it is necessary to carry out a portion of the grinding in water it would be impracticable to regrind in solution. In view of the fact that regrinding is necessary for making a total slime product, that statement would have covered the ground.

I wish to thank Mr. Rhodes for calling attention to this matter and giving me the opportunity of clearing up a point upon which there may have been some misunderstanding.

H. A. MEGRAW.

New York, Aug. 30, 1912.

The Ton

I think E. W. Parker has misconstrued my letter in the JOURNAL of July 6. I am aware, as he states in the JOURNAL of Aug. 3, that in many industries the usual weights are in long tons. But personally I do not think it always true, that "whatever is, is right." Mr. Parker, as statistician in charge, should know better than anyone else the time spent in converting 227,513,809 lb. into long tons, or in adding 432,132 lb. to 423 long tons, 5 cwt. 6 lb., or in a number of other problems which may present themselves.

What I meant to imply in my former letter, is that we have broken away from £, s. and d., and that it might be well for the Geological Survey to throw its influence, which is certainly of very great weight, on the side of a rational ton of 2000 lb. for everything. It has, as I implied before, struck me that the use of the long ton is increasing. The disadvantages are obvious. Isn't it up to the Geological Survey to do something to rationalize our measures, even if Maryland, surrounding Washington on three sides, does choose to legalize the long ton?

AMERICAN.

Chicago, Ill., Aug. 20, 1912.

Lake Superior Institute Meeting

Special Correspondence

At the seventeenth annual meeting of the Lake Superior Mining Institute held at Houghton, Mich., papers on mine safety, concrete shaft construction, rock-house practice, and copper-mining problems from a geologic standpoint were read. Excursions were made to near-by copper mines where features of the surface equipment were studied.

The seventeenth annual meeting of the Lake Superior Mining Institute, held in Houghton, Mich. and the copper country on Aug. 28, 29 and 30, 1912, was well attended and was probably one of the most instructive ever held. At this meeting many excellent papers were delivered and a notable interest was displayed by the members in the discussion that followed.

Michigan Smeltery Visited

The work of the institute began Wednesday with an excursion to the Michigan smeltery, where Copper Range, Mohawk and Wolverine ores are treated. There the smelting practice was briefly studied and the pouring of the copper and the casting of it by a Walker machine was watched.

From the Michigan smeltery the train proceeded to the Copper Range mines. First the Nordberg four-stage compressor at Painesdale was inspected. This is said to be one of the most economical compressors in the world. Steam at 250-lb. pressure is used, as the 350-lb. boiler pressure planned in its design was too much of a strain on the boilers to be withstood efficiently. After the steam plant was inspected, the party visited the machine and blacksmith shops, where the method of handling and sharpening the drills attracted attention. A few members were well enough posted to go to the master mechanic's office to see how the drawings and specifications were filed, shop patterns kept track of, and the blueprint system of ordering followed out. The details of the practice at this shop are fine indeed, and the shop worthy of extended study.

From the Champion property the train went to the Baltic mine where the rock-house practice and the method of changing the skips, loading stulls 14 ft. or so long and from 15 to 24 in. in diameter, were seen, and the general layout of the shaft house studied. The change house was also visited.

In the evening after a short address by the president, F. W. Denton, in which he referred to the general conditions of the industry in the Lake Superior districts, the institute began the consideration of the different papers prepared for the meeting. The members and guests were all supplied with advance copies, and the writers of a paper merely had to introduce the discussion by giving a synopsis of the paper.

Safety Inspection at Cleveland-Cliffs

The paper by William Conibear on the "System of Safety Inspection of the Cleveland-Cliffs Iron Co.," brought out a lively discussion. The important part of the system is the way that the inspector is made to watch the bosses and men, and the men and bosses in turn to watch the inspector. It is not so much the installation of safety appliances that promotes safety, but the enforcement of rules made possible by close inspection. Already a reduction of 20% in the number of serious accidents has resulted. Mr. Duncan says that a study of the records of the Cleveland-Cliffs company for many years shows that only 4% of the accidents would have been prevented by the safety appliances since installed.

Good Field for Prospecting

Dr. Alfred C. Lane, former state geologist of Michigan and professor of geology at Tufts College, then read a paper on "The Unexplored Parts of the Copper Range of Keweenaw Point." He noted how few of the possible carriers of copper in the region had been prospected. He called attention to the fact that almost all the prospecting so far had been where it would be cheapest, in the regions where the covering of glacial drift was thin, but that genetically there was no reason why more copper should occur under such areas than under other areas of the series more deeply and completely covered.

He also called attention to the fact that the effect of cross fissures on the mineralization had as yet received little attention in the copper country. He gave expression to an observation that has been noted by others to apply to other classes of copper deposits, that the copper is often found in the places of sluggish circulation rather than in the open fissures and that such a fact must be borne in mind when prospecting the cross fissures. Doctor Lane then noted certain parts of the region especially worthy of prospecting and, in closing, expressed the opinion that the future of the copper peninsula was as promising as at any time in the past for the finding of large bodies of copper, only the prospecting would be more costly and tedious.

The next paper was the one read by Dr. L. L. Hubbard on "Foot-wall Shafts in Lake Superior Copper Mines." This was an interesting paper on the proper placing of the shaft. Doctor Hubbard's main argument was the loss of profit on ore tied up in shaft pillars. Figures were given showing the profit resulting from the releasing of this tonnage. The discussion of the paper was interesting. Mr. Lawton was called on for his opinion on foot-wall shafts as gained by experience in the Quincy mine near-by. He and Professor Sperr then got into a discussion as to whether the leaving of ore over a foot-wall shaft was advisable or not. Mr. Sperr apparently has some reason with him when he maintains that the leaving of the ore pillar over the shaft concentrates the weight there. The truth is that local conditions control this placing of the shaft entirely. It is the failure to recognize certain fundamentals of mining that made so apropos the words with which the president, Mr. Denton, closed this interesting discussion: "It is evident that the safe place for a shaft is yet to be found."

H. T. Mercer briefly outlined his paper on "Some Applications of Concrete Underground." This paper called forth some discussion and the meeting closed, Edwin N. Cory's article on "Raising Shaft at Rolling Mill Mine" being read by title only.

Thursday morning a special train took the institute to the Calumet & Hecla mill, at Lake Linden, where the power plant, mill, pump house and regrinding plant were visited. There the visitors had a chance to see much large machinery and to observe how fine much of the metallic copper was in the conglomerate ores and the reason that fine grinding was so necessary to get the last of it. The members also had an opportunity to observe the Woodbury jig in action, the Calumet & Hecla installation of this jig being the most important one in the world. In the fine-grinding plant the different fine-grinding devices could be seen, these being largely chilean mills with one conical and one regulation tube mill being tested against them. The conical mill, I understand, is as promising as any of them. A notable feature was the large wheels for handling the tailing.

Concrete Shaft Sets at Ahmeek

From Lake Linden the special went to the Ahmeek mine, where the rock-house practice was observed and the manner of making the concrete "timber" sets used in the shafts of that property was noted. It was an excellent idea of the management to have a complete shaft set put up and bolted together on surface where it could be observed carefully. The caps are divided in half, so that they weigh

about 1000 lb. each. Three men are able to lift them in place. Once in place, the whole set, after being bolted and bound together, is secured to the walls of the shaft by concreting the space between the set and the walls of the shaft. Concrete slabs are used for the lagging. A fireproof shaft is thus obtained. The first cost of the concrete sets is less than that of timbers at Ahmeek, but I doubt whether they cost less in place. At Ahmeek a train of cars loaded with mass copper, two pieces of which weighed over ten tons each, was standing on the tracks ready to go to the smelter. The size of the masses was notable, although, of course, not ranking with the one recently found in one of the Copper Range mines.

Descending Skip Used to Compress Air

From Ahmeek the excursionists went to Electric Park, where luncheon was served. From there the visitors were taken to the Franklin Junior property, where the new style of hoist, devised by Mr. Edwards, the manager of the property, and worked out as to details by Mr. Nordberg, was observed. With this device, the hoisting is done with one unbalanced skip. In lowering, the hoist is made to act as a compressor and pump air into a receiver, thus breaking the skip in its descent. With this air the load is returned about 700 ft., or about one-fifth the depth of the hoisting shaft, which is 3300 ft.; owing to the unbalanced weight of the cable, which is 1½ in. in diameter, this represents about one-third of the work. When the pressure has fallen in the receiver to 80 lb., a valve opens in the steam pipe leading from the boilers to the receivers, and the rest of the trip is completed, running on a mixture of air and steam. The system works well, but as yet the efficiency has not been tested.

The skip holds 10 tons, having a capacity of 223 cu.ft. and weighs about 7 tons, making it the largest in the world. After viewing the boilers and engines, the skip was studied as to construction and the ore house visited. A notable point in the rock house was the abruptness of the dump tracks, which rise almost vertically from the tracks, which dip at about 47 degrees.

The speaker of the Thursday evening meeting was Dr. J. A. Holmes, of the Bureau of Mines. He outlined the purposes of the bureau and its aims, stating that information gathered by it was treated confidentially and given forth in such a way as to aid the mining public and yet not injure the individual mining companies. The two aims were to eliminate unnecessary waste and protect the lives of men following mining. His address was well received and greatly applauded.

Friday Session

Friday morning the rest of the papers of the meeting were taken up at the Michigan School of Mines. E. B. Wilson, editor of *Mines and Minerals,* read an article on "Mine Sanitation," which led to some discussion. Then the papers of T. C. De Soller and H. T. Mercer on "Rock-House Practice" were read by title, as was that of Edward Koepel, on the "Intakes at the Champion and Trimountain Mills." "The New Franklin Hoist," a brief description prepared by R. H. Corbett to enable the members to understand the workings of this innovation which they visited at the Franklin shaft, also was read by title, as was F. W. Sperr's paper on methods of mining iron ore. O. P. Hood outlined his paper on "Balancing Rock Crushers."

Dr. L. L. Hubbard then gave a resumé of his paper on the influence of the thickness and contour of the foot-wall beds on the mineralization of the copper-country lodes. In this paper he emphasized the importance of fracturing and open spaces due to crushing rather than blow-holes in the genesis of the ore, assigning to the amygdules or blow holes, as their main function in the mineralization, the important feature of determining the lines of weakness along which the flows failed, so as to allow entrance of the mineralizers. His studies in the district led him to think that the mineralization, at least as far as the precipitation of the copper is concerned, is due mainly to reduction of pressure caused by the slipping and crushing of the rock along these lines of weakness. Then Doctor Hubbard outlined his views on the importance of the ancient topography upon the mineralization, especially in the Ojibway. It is an original idea, to which Doctor Lane took exception.

Prof. F. W. Sperr outlined, by means of drawings and a model, the ease with which it was possible to lose the lode in the Lake Superior mines if the fracture was not closely studied. Doctor Hubbard called attention to the possibility of detecting the direction of movement along fault planes by rubbing a pencil over a paper placed on its surface, so as to accentuate the visibility of the scratches on the walls of the slip.

After the reading of the resolutions on the death of Graham Pope, a former president of the institute, the meeting closed with the reading of committee reports and the election of officers and new members. The increasing importance of this institute is well shown by the fact that it shows a gain of over 10% in membership this year. The officers chosen to serve during the ensuing year are as follows: President, Penticost Mitchell, Duluth, vice-president of the Oliver Iron Mining Co. Vice-presidents, W. P. Chinn, McKinley, Minn., of Pickands, Mather & Co.; Francis Webb, Gilbert, general manager of mines of Republic Iron & Steel Co. in Lake Superior district; R. E. Edwards, of the Atlantic mine. Managers, Charles H. Baxter, Loretto; W. H. Johnston, Ishpeming; G. S. Barber, Bessemer. Secretary, A. J. Yungbluth, Ishpeming. Treasurer, E. W. Hopkins, Commonwealth. The 1913 meeting of the institute will be held on the Mesabi Range.

August Mining Dividends

Mining dividends paid by 21 United States mining companies in August amount to $1,643,544, disbursements by coal, iron, metallurgical and holding companies to $11,062,887, and by other North American mining companies to $763,441.

United States Mining Companies	Situation	Per Share	Total
Alaska Mexican, g.	Alas.	0.35	63,000
Alaska Treadwell, g.	Alas.	0.75	150,000
Alaska United, g.	Alas.	0.50	90,100
Bunker Hill, Con., g.	Calif.	0.07½	10,000
Bunker Hill & Sull., l.s.	Ida.	0.20	65,400
Colo. Gold Dredging, g.	Colo.	0.25	25,000
Fremont, g.	Calif.	0.02	4,000
Frontier, z.	Wis.	2.00	2,500
Golden Cycle, g.	Colo.	0.02	30,000
Grand Central	Utah	0.05	25,000
Hecla	Utah	0.02	20,000
Homestake, g.	S.D.	0.50	109,200
Miami, c.	Ariz.	0.50	332,470
Morning Star Con., g*	Calif.	0.25	
Mohawk, c.	Mich.	2.50	250.000
Parrot Silver & Cop., c.	Mont.	0.15	34,477
Pittsburgh-Idaho, l.	Ida.	0.04	32,120
Tenessee, c.	Tenn.	1.00	200,000
Tom Reed, g.	Ariz.	0.05	45,478
United, c.	Wash.	0.01	10,000
United Verde, c.	Ariz.	0.75	225,000
Wasp No. 2, g.	S.D.	0.02	10,000
Yellow Pine, g.	Nev.	0.02	19,000

*Dissolution dividend.

Coal, Iron, Industrial and Holding Companies	Situation	Per Share	Total
Amalgamated Copper, c.	Mont.	1.00	1,538 879
Cambria Steel	Penn.	0.62½	562,500
Greene-Cananea,	U.S.	0.25	618,828
Inter. Nickel, pfd.	U.S.	1.50	133,689
Inter. Sm. & Ref. Co.	U.S.	2.00	200,000
Island Creek Coal, com.	U.S.	3.50	525,000
Jeff. & Clfd. C. & I., pf.		2.50	37,500
Lehigh Coal & Nav. Co.	U.S.	2.00	482,936
National Carbon, pf.	U.S.	1.75	78,750
St. Mary's Min. Ld. Co.	Mich.	1.00	160,000
U. S. Steel, pfd.	U.S.	1.75	6,304,919
Va.-Car. Chem., com.	U.S.	1.50	419,886

Canadian, Mexican and Central American Companies	Situation	Per Share	Total
Amparo, g.s.	Mex.	0.03	60,000
Buffalo, s.	Ont.	0.03	30,000
Coniagas, s.	Ont.	0.45	360,000
Crown Reserve, s.	Ont.	0.05	88,441
Dominion Coal	N.S.	3.50	175,000
Standard Silver-Lead, s.l.	B.C.	0.02½	50,000

The increased price of copper is again shown in the dividend of the Mohawk Mining Co., which has increased its dividend from $1 to $2.50, although Tennessee's rate dropped 50c. from $1.50. Other than this there were no important changes during the month.

Mining dividends paid by United States mining companies making public reports amount to $36,226,119 for the first eight months of 1912, and for mining, metallurgical and allied companies, to $110,502,282.

Caving System in Chisholm District—I

By L. D. Davenport*

The method of developing the iron-ore mines of the Chisholm district of Minnesota is illustrated by a description of the development of a hypothetical mine but which is typical of the system employed on the Mesabi range.

*Oliver Iron Mining Co., Mesaba, Minn.

The orebodies in the Chisholm district of Minnesota are large, shallow, trough-shaped deposits with no appreciable pitch locally. The ore itself is a soft, earthy hematite mixed with some limonite. It is, however, sufficiently compact so that small drifts will stand without timbering for several years.

In order to describe more clearly the methods of developing an underground mine, let us consider the Nels property, an imaginary 40-acre tract, which has been developed according to the methods used in this district. The "forty," like all others previous to development, has been explored by churn and diamond drills, cross-sections through the drill holes have been made, and from them top and bottom contour maps have been worked out.

Shaft Placed Where Ore Is Deepest

These ore-contour maps show the orebody to be in a shallow trough running approximately east and west, the greatest depth being at the western end. Accordingly, the shaft was sunk at this end of the trough through the orebody to the taconite[1] below. It was placed in the deepest part of the ore, since in this position it drains the entire orebody and can be used for hoisting until the mine is completely worked out.

The shaft is vertical, 6x18 ft. inside, and has three compartments, two skipways, 5x6 ft., and a ladderway, 7x6 ft. The corner studdles, end pieces and wall plates are 12x12 in. square timber, and the center studdles and dividers are 6x12 in. The shaft sets are placed 5 ft. apart on centers, as is customary in good ground. Sollars are placed in the ladderway at 15-ft. intervals, and 16-ft. ladders are set between them.

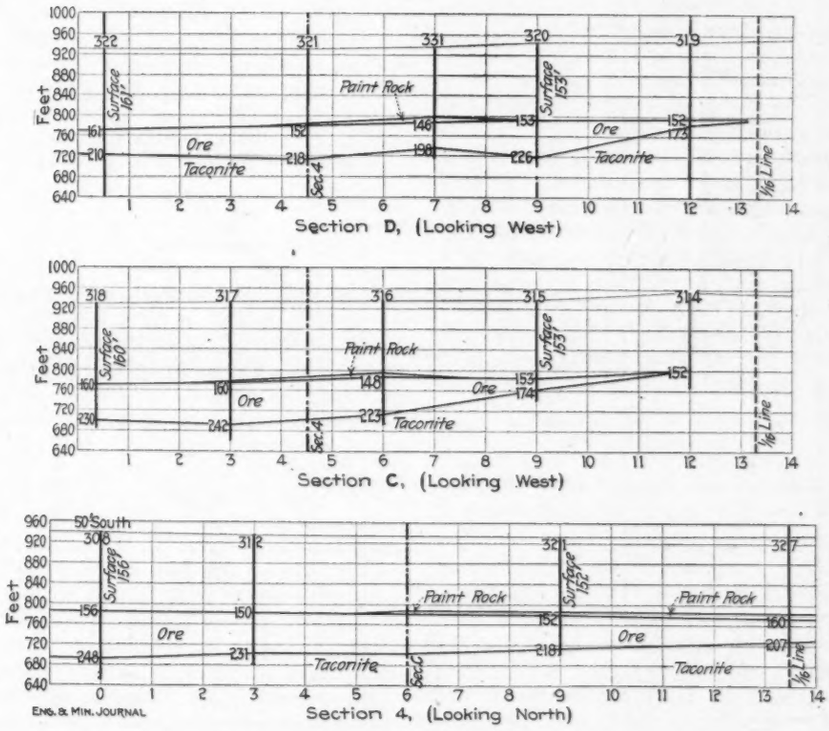
In determining the site of the main tramming level, there are two principal points to be considered: First, it should be as near the bottom rock as possible, so that the greater part of the ore will be mined above it; second, it should be at such an elevation that with a grade of say 0.5% (or whatever is considered necessary for drainage and tramming), it will encounter the bottom rock at the point from which it is desired to handle ore from the levels above. Where the pitch of the formation is steep, it may be necessary to use two levels for tramming in order to hold close to the bottom rock and still cover the territory desired.

Having determined the elevation at which the main level is to start from the shaft, the next step is to cut in the station, pocket and pump room. Ordinarily, there should be 40 ft. of shaft below the main level, 20 ft. for the pocket, 10 ft. for the skip pit, and 10 ft. for the sump, although a sump does not necessarily have to be the full size of the shaft. The skip pit is sunk into the rock for 10 ft. below the bottom of the pocket, and a cushion of heavy timber is made for the skips to rest on. The sump is 6x6 ft., and is sunk in the ladderway 15 ft. below the skip pit.

Two Parallel Main Drifts Are Driven

The main level was driven on a 0.5% grade starting at the shaft with an elevation of 712 ft. The accompanying map shows the two parallel drifts 10x9 ft. inside, running east, 90 ft. apart on centers. These two main drifts are connected at 150-ft. intervals with loop drifts 8x9 ft. inside.

The rock was encountered in the bottom of the north drift at about 1050 ft. east, and in the south drift at about 1160 ft. east. From these points east around



CROSS-SECTIONS OF THE NELS IRON MINE

Wherever possible, the pump room should be on the same elevation as the bottom of the pocket, so that the skip tender can also look after the pump, thus saving a man.

In the Nels mine, the station on the main level is 20 ft. long, 11 ft. high and 16 ft. wide. The top of the pocket is 11 ft. wide along the shaft, and extends back 16 ft., the full width of the station, where it drops vertically 3 ft. and then slopes to the shaft at a point 20 ft. below the level. The pump room is an 8x8-ft. drift extending south from the ladderway for 15 ft., the bottom being on the same elevation as the bottom of the pocket.

the last loop, it was necessary to take up from 2 to 3 ft. of rock in the bottom, to maintain a uniform grade.

In some of the mines in this district, when a "horse" of taconite is encountered, it has been found cheaper to drive several hundred feet through solid rock, than to put in an incline from a higher level, and use a small steam hoist.

The two main drifts in the Nels mine were driven by two gangs of four men, two working day shift and two working night shift in each drift. The average rate of drifting was about 100 ft. per month. These gangs put in the open sets for the loops, and then continued the

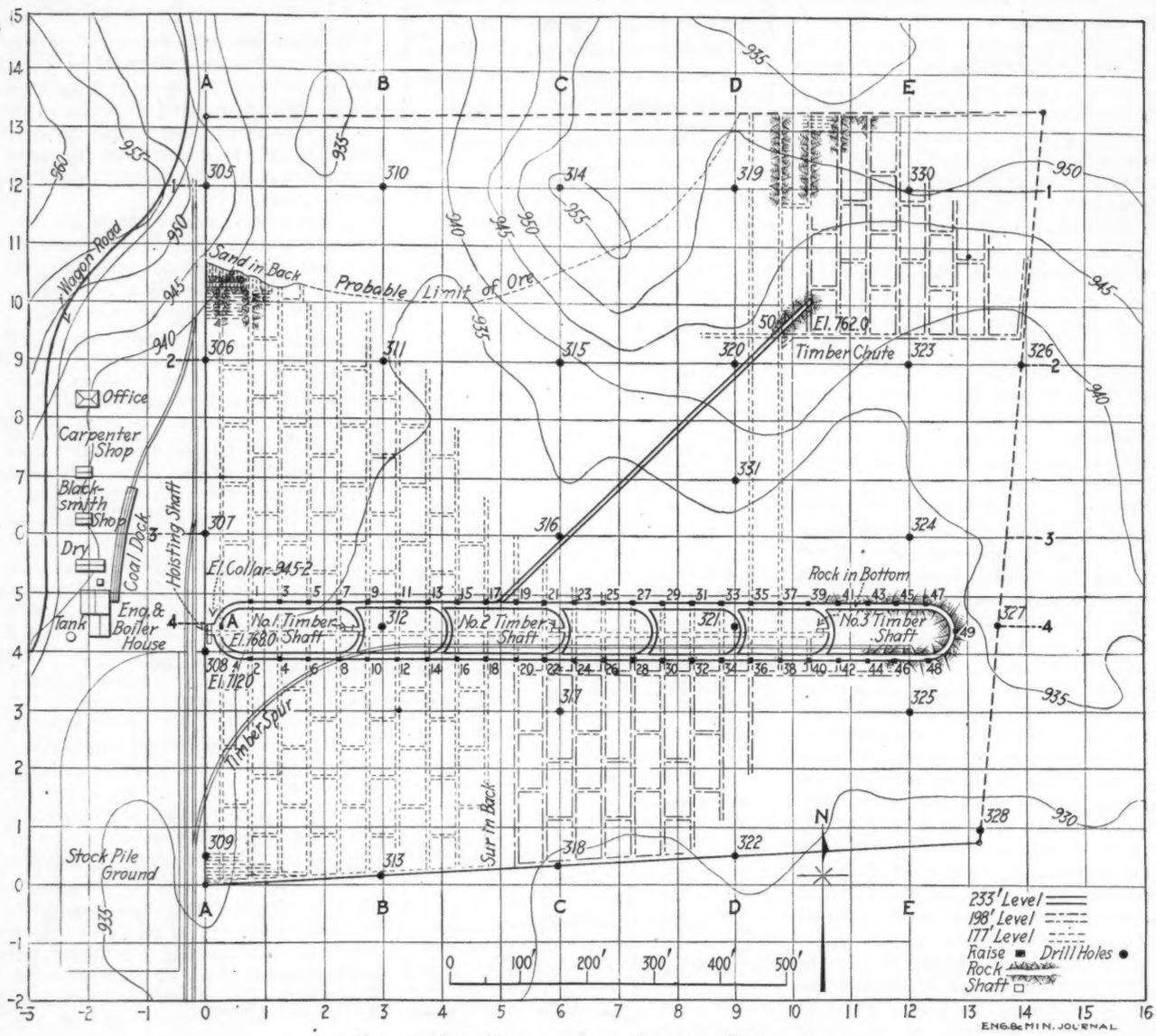
[1]A name proposed by Winchell for the cherty or jaspery, but at times calcareous or more or less quartzitic rock that incloses the soft hematites of the Mesabi Range in Minnesota.

straight drifts while the loops were put in by a third gang. As soon as the main-level drifts were 80 to 100 ft. away from the shaft, another gang started putting up raises, No. 1 and No. 2, etc. Plank chutes were built in the bottoms of these raises and fitted with iron stoppers or "quarter-pans." A fourth gang was started driving a 6x8-ft. drift for timber due east from the ladderway of on this sublevel had advanced sufficiently, more gangs were started driving the crosscuts, which were 6x7 ft., to the north and south.

Auxiliary Shafts Cut by Sinking and Raising

While the sublevel was being developed gangs on the surface were sinking the timber shafts through the surface to the 6x6-ft. timberway and a 2½x6-ft. ladderway timbered with regular 12x12-in. square timber sets, and 6x12-in. dividers, as in the hoisting shaft.

The cross-sections show a "horse" of taconite extending into the orebody from the east property line, leaving a narrow channel of ore which runs northeast through pits 316 and 320. Accordingly, a branch drift was turned off from the



MAP OF NELS MINE, AN IDEAL IRON-ORE PROPERTY

the shaft, at an elevation of 768 ft., which was called the 177-ft. level, as determined from the cross-sections. This gang dumped their ore directly into the skip from the ladderway, until they struck the raise 16 ft. from the shaft, which was put up at the back of the station. This raise is planked up when it passes through the station, so that the ore from the sublevel runs directly into the pocket. As they drove east, they put in open sets for crosscuts, at 50-ft. intervals, which were later extended to intercept the raises from the main level. When the first gang top of the ore, putting in the timber as they went down. After the first loop was finished, a gang drove a drift from the center of the loop west into the pillar, and raised to meet the timber shaft which had been sunk through the surface. This raise was about 4x4 ft., which was trimmed to the full size, and timbered after holing through to the shaft. This No. 1 timber shaft is 6x6 ft. inside, and cribbed with round timber. Timber shafts No. 2 and No. 3 were put down in the same way. These two last are two-compartment shafts 6x9 ft. inside, having a north tramming drift at about 500 ft. east, and driven northeast following this channel.

Drifts Are Driven Along Property Lines

This drift struck the bottom rock at 900 ft. east. A raise, No. 50, was then located directly north of raises No. 37 and No. 38 (on the main tramming drift) and extended to the capping. A 6x7-ft. drift was run east from the raise at an elevation of 762 ft. (determined from cross-sections), and crosscuts were

turned off at 50-ft. intervals, to correspond to the development already begun on the south. A small drift was driven along the property line which, although not used for actual mining purposes, eliminated any chance of trespass on this sublevel. It is the usual practice to run small lease line drifts on each sublevel, before stoping is started, but when the slice drifts run parallel to the property line, it is not so necessary. For example, see drift north of raise *A*, where slicing has been started.

The timber drift on the 177-ft. level diven east from the shaft struck "paint rock" and soft slate in the back, at about 800 ft. east, but by cutting into this capping from 1 to 2 ft., the drift was extended to No. 3 timber shaft. The drifts north from raises *A*, No. 1 and No. 3, struck the shore line between 1000 and 1100 ft. north. The term "shore line" is used to denote the edge of the ore formation, where the ore pinches out between the capping and the bottom rock. The drifts south from raise No. 18 had surface in the back for the last 15 ft., and the drift south from raise No. 20 on the same level was cut off by the surface 100 ft. from the raise; therefore, gangs were started drifting south from raises No. 20 and No. 22, 12 ft. below the 177-ft. level, and the development was carried on toward the east, as shown by the map. The drift north from raise No. 37 on the 177-ft. level was used for a timber drift. All the timber required in the northeast corner of the mine on the 198-ft. level was brought up to this drift and dropped down the inclined timber chute to the level below.

Development Limited by Capping

On account of the dip of the capping, it was not possible to carry the development of the 177-ft. level farther east than the drift north of raise No. 37. The timber for the workings on the 198-ft. level on the south side was lowered down the raises No. 20, No. 22, etc., from the upper level. The east and west timber drifts connecting the shafts were timbered with regular drift sets, i.e., a cap and two posts to each set. These sets were placed either 5 or 7 ft. apart on centers, according to the ground, and 6- or 8-ft. lagging was used to steady the back. This drift and all others, which were to stand for several years, were carefully timbered to prevent their caving. The north and south drifts were timbered only as far as the raises, for beyond them the level would soon be mined out. Below the top level, it is necessary to timber all drifts to prevent their crushing on account of the weigh of the caved ground above.

There are a few general rules always followed in this district. Wherever possible the grade should not exceed 0.5%. All pillars should be 50 ft. from center to center of the slice drifts. All slice drifts should be directly below the corresponding drifts on the level above. The general surface lay-out is shown on the map. The arrangement of the mine buildings, tracks, etc., are typical of this district. The timber yards are over the pillar between the main tramming drifts, since this is the last part of the mine to be worked out.

(To be continued)

Normal and Reverse Faults

The data available for identifying reverse faults are few enough, and it is advisable that the greatest care should be taken in their observation, says Ernest K. Hall (*Aust. Min. Stand.*, June 13, 1912) in commenting on the indications that may be used for distinguishing normal and reverse faults.

In metal mines it is seldom possible to learn whether the country in the hanging wall of a fault has been raised or depressed, by matching unconformable rocks on each side of the fault. The country rock is often homogeneous, and even when unconformability exists, the section shown by the mine opening is so small that it rarely affords help. This evidence, however, amounts to absolute proof when it is obtainable, and is about the only evidence that could be called certain.

There are other indications which may serve as guides in the absence of certainty. A bending up of the hanging wall or bending down of the foot-wall selvage toward the bending plane in a normal fault and a converse bending in a reverse fault is one of these indications. This bending is sometimes seen on only one side of a fault and in many cases it does not appear on either. Sometimes the bending is so pronounced that it may change the dip or strike of an orebody and may be encountered before the existence of the fault is suspected.

Striæ on the walls of the fault plane are often present, especially when the walls are well defined. They are due to projections or loose stones between the moving surfaces. Definite grooves usually begin deep and narrow, becoming more shallow and wider as they progress. The sharp end points to the direction from which the dislocated rock has moved. This may be misleading if there has been more than one movement, as the later movement, although the lesser, will leave striæ indicating its own movement and confusing or obliterating the earlier and more important throw.

Fragments or boulders of ore occur in the fault channel and constitute a valuable clue. It may occur, however, that a reverse movement has left boulders in two directions, thus rendering the information of decidedly less value.

The majority of reverse faults dip at lower angles than 45° and the lower the angle of dip the more likely is the fault to be reverse. It is probable that the majority of faults dipping at less than 20° are reverse, and without strong evidence to the contrary it is well to assume that such is the case when laying out search work. On a mining field when a number of faults are known, the character of a newly cut movement plane may be more intelligently considered in the light of the known character of already studied faults.

The amount of brecciation is no accurate guide to the amount of throw of a fault, for while a large amount of débris undoubtedly shows much movement, still this movement may have been more or less compensatory in each direction, resulting in little throw together with a large amount of brecciation.

In searching for orebodies which have been moved by a fault it is recommended to cut entirely through the faulted zone and drive parallel with the fault plane in the solid country in the direction in which the orebody is supposed to lie. If the distance is great crosscuts may be run into the fault zone at convenient intervals in order to be sure of its presence and to investigate its character.

When several faults are present within a comparatively small area, it is usually true that there is one major fault and other subsidiary ones subject to the same governing characteristics in less degree. There may be a series of fault throws in one direction resulting in step faults. Where such faults occur in frequent steps there is little difficulty in picking up each one, but the operation may be so costly as to prevent the profitable exploitation of the deposit.

Railway Routes in Alaska

It is pointed out by the U. S. Geological Survey in an advance chapter from *Bull.* 520, "Mineral Resources of Alaska, 1911," that the full industrial development of inland Alaska can be brought about only by constructing railways to some of the open ports on the Pacific. The region which would be developed comprises about 200,000 square miles in central Alaska, or more than one-third the entire area of Alaska.

The three routes now in use for reaching Fairbanks, and other inland districts, are available for but four months of the year. Central Alaska has less than 300 miles of railway, not over 600 miles of wagon road and probably less than 1000 miles of trail. Three possible routes of approach for railways from the Pacific to central Alaska are indicated: (1) From Lynn Canal, by way of the Chilkat, Alsek, White and Tanana River basins; (2) by way of the Copper and Tanana basins; (3) by way of Kenai Peninsula and Susitna and Tanana River basins. Within these general zones there are several alternate routes.

Chronology of Mining for August, 1912

Aug. 1—An explosion of gas occurred in the colliery of the Washington-Wheatland Coal Co., at Wheatland, Ind., injuring five men, two fatally.

Aug. 2—A premature explosion on the 17th level of the "D" shaft of the Newport mine, at Ironwood, Mich., killed one miner and injured another.

Aug. 3—Festivities celebrating the centenary of the Krupp iron works at Essen begun.

Aug. 8—An explosion in the Lothringen colliery near Gerthe, Germany, killed 111 and injured 20 men.

Aug. 12—Announcement was made of the organization of the Alaska Gold Mines Co., to acquire control of the Alaska-Gastineau Mining Co., owning large, low-grade gold deposits near Juneau, Alaska.

Aug. 13—An explosion in the Abernant colliery, 28 miles from Birmingham, Ala., killed 37 men.

Aug. 27—Four miners were killed by blackdamp in the Frontier colliery, at Linden, Wis.

Aug. 29—The powder factory at Monte Chiari, near Brescia, Italy, where the explosive Imperialite was made, exploded, killing Marquis Imperiali, the inventor of the explosive.

Aug. 30—A wooden platform collapsed at a colliery at Gelsenkirchen, in Prussia, allowing six men to fall down the shaft, five of whom were instantly killed.

International Congress of Applied Chemistry

More than 500 chemists went from New York to Washington on Tuesday, Sept. 3, 1912, for the inaugural meeting of the eighth International Congress of Applied Chemistry, where they will be welcomed by President Taft. They will return on Thursday, Sept. 5, for the real business of the session.

Societies holding joint sessions with the International Congress of Applied Chemistry are: Society of Chemical Industry; American Chemical Society; American Electro-Chemical Society; Verein Deutscher Techniker; American Peat Society; International Association for Testing Materials; and American Institute of Mining Engineers.

The Chemists Club at 52 East Forty-first St. is headquarters for the visiting chemists and the annual meeting of the Society of Chemical Industry was held there Tuesday, Sept. 3. After President Mitchel, of the Board of Aldermen, had extended a welcome, the election was held, which resulted in the choice of Prof. Marston T. Bogert, of Columbia University, as president.

The society, which is of British origin, has had only three other American presidents, the last of whom was Acting-President Ira Remsen, of Johns Hopkins University. The society's medal was awarded by proxy to Sir William Crookes, the octogenarian chemist, whose name is associated with radium and X-ray investigations.

Some of the distinguished men in the field of applied chemistry who are attending the congress from abroad are Dr. Giacomo Ciamician, Bologna; Dr. Berthold Sassow, Leipzig; Etsuzo Yamamura, Tokio; Dr. F. Raschig, Ludwigshafen; Dr. Gabriel Bertrand, Paris; Dr. Samuel Eyde, Christiana; Dr. Carl Duisberg, Elberfeld, and William Henry Perkin, Manchester, England.

International Association for Testing Materials

The sixth triennial congress of the International Association for Testing Materials convened on Tuesday, Sept. 4, 1912, in the auditorium of the Engineering Societies Building, New York. About 600 engineers, representing 27 countries, registered before noon. Henry M. Howe presided, and speeches of welcome were made by Brig.-Gen. William H. Bixby, Chief of Engineers United States Army; Gov. John A. Dix; and Comptroller William A. Prendergast, of New York.

Some of the delegates are: Alfred Deinlein, Chief Engineer of the Austrian Ministry of Commerce; Ernest Reitler, Engineer and Inspector of the Austrian Royal State Railways; Emile T. Camerman, Chief Chemist of the Belgian State Railway Administration; P. Christophe, Chief Engineer of Bridges and Roads at Brussels; Herman Hubert, Belgian Inspector General of Mines; Louis Breda, Engineer in Chief of the Belgian State Railways; Dr. W. C. Unwin, president of the British Institution of Civil Engineers; Dr. Archibald Denny of the famous shipbuilding firm of Denny Bros. of Dumbarton, Scotland; Lieut. E. Rung, representing the Danish Ministry of War; M. Le Chatellier, Inspector General of Mines for France; M. Mesnager, French Chief Engineer of Mines; Profs. Gary, Heyn and Hinrichsen of the Royal Prussian Testing Bureau; Privy State Councillor Jaeger of the Prussian Ministry of Commerce and Trade; First Councillor of Construction Jahnke of the Prussian Railway Administration; J. Marx, president of the Hungarian State Railways; A. Fodor, Chief Engineer of the Hungarian Board of Public Works.

Prof. Modesto Panetti of the Royal Polytechnic School of Turin, Italy; Shohe Tanaka, Director of the Bureau of Experiments of the Japanese Government Railways; N. C. Ihlen, former Norwegian Minister of State; Gabriel Smith, Director of the Harbors of Norway; N. Belebubsky and S. Kareicha, Privy Councillors and professors in the Russian Institute of Engineers of Ways of Communication; Prof. Douchan Thonitch, Director of the Servian Institute for Testing Materials; Don Rudesindo Montoto y Barzal, Commander of Engineers of the Laboratory of Materials of the Corps of Engineers in Spain; Col. Augusto Larzabal of the Spanish Artillery; Prof. F. Schule of the Swiss Federal Technical High School, and John Oskar Roos of the Technical High School, Stockholm, Sweden.

Investigation of Alaska Coal Field

A Seattle dispatch states that 35 men from the U. S. Bureau of Mines sailed for Alaska on Sept. 2, 1912, to investigate the value, extent and availability of the Bering River coalfields for the use of naval vessels. The weather conditions in Alaska at this time of year are decidedly unfavorable, with almost continuous rain and snow.

It is reported from Juneau that 300 of the 1100 Alaska coal claims have been canceled by the General Land Office. In most cases the cancelation was caused by failure to make application for patent within the time specified by law. A few claims in the Bering River field were canceled because it was charged that they were not made in good faith. As a result of the indictment of Frank Watson, the promoter of a group of claims in the Matanuska district, in March, 1911, for conspiracy to defraud the United States, 43 claims have been canceled. Charges of fraud or failure to apply for patent are pending against many other Alaska coal claims.

Trouble in Mexico

Disquieting rumors of impending attacks by Mexican rebels upon Americans residing in Cananea, El Tigre and Nacozari in Sonora have been published frequently in the press within the last few days. While it has been impossible to corroborate many of the dispatches, the reports indicate that bands of rebels were marching on or planning attacks on these camps.

There are about 70 Americans at El Tigre and it is stated that a band of several hundred rebels was marching to attack the place, but changed its plans on learning that there was to be armed resistance by the Americans. It has been said that there has even been fighting at Nacozari, but the reports received have been vague. At Cananea a larger American population, possibly numbering 500, is preparing to offer resistance should an attack be made by the large band of rebels said to be marching toward the town. The rebels are reported to have burned the bridges on the railroad connecting Cananea with Naco Ariz., and to have cut the telegraph wires.

Details of Practical Mining

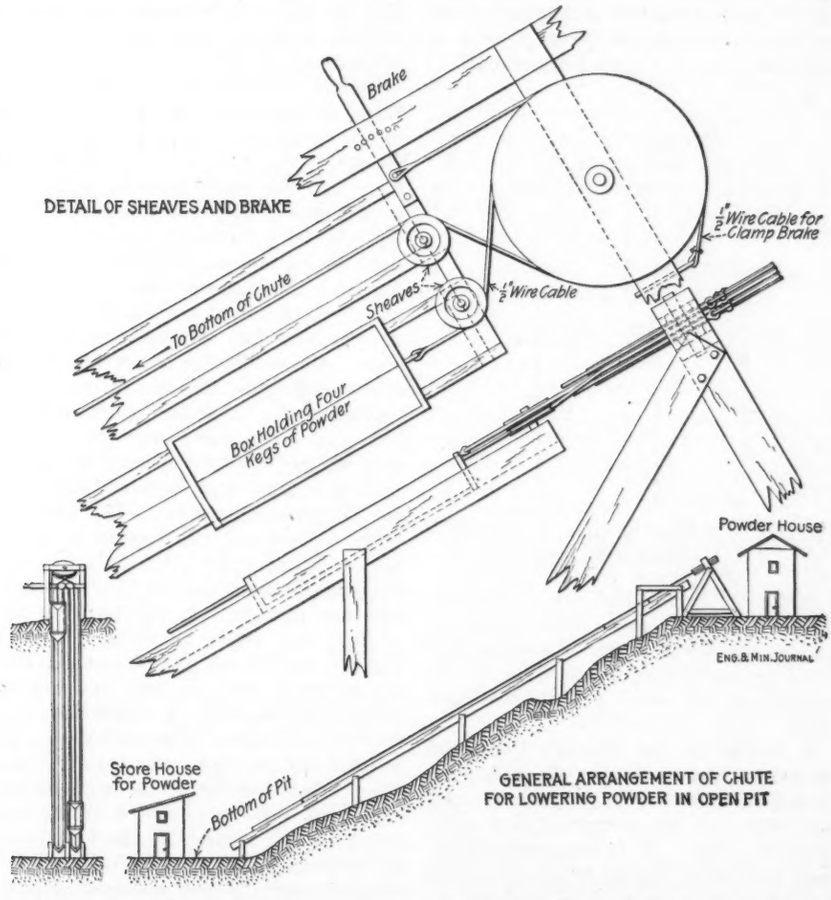
Accounts of Useful Ways of Doing Many Things in the Day's Work

Powder Chutes for Open Pits

By B. M. Concklin*

A unique arrangement has been installed in several of the open pits upon the Mesabi range for the purpose of saving time and facilitating the distribution of black powder to points within the pits. The arrangement is simple in itself, consisting of two greased slides in which run two triangular shaped boxes made to carry from four to six kegs of black powder, and an arrangement of sheaves at the top of the slides as shown in the accompanying engraving. The operation is accomplished by means of gravity, the loaded box carrying the empty one to the top. The speed is regulated by means of a brake shown in the engraving.

Where the pits are deep and the lower levels are inaccessible, except by long and steep climbs, this contrivance has been the means of a considerable saving of time and money as well as acting as a safety device for the prevention of possible explosions when the powder is thrown over the banks into the pits.



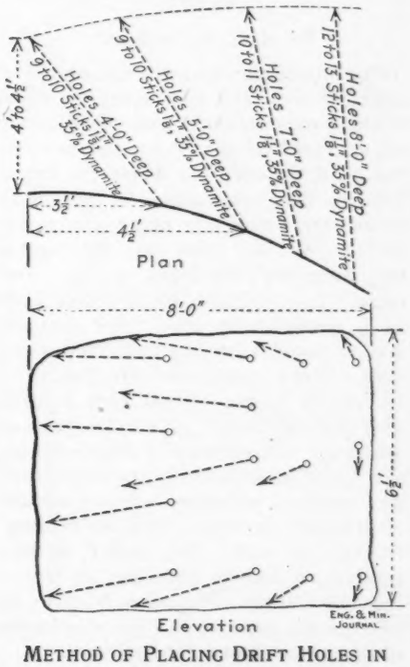
GENERAL ARRANGEMENT OF CHUTE FOR LOWERING POWDER IN OPEN PIT

Drift Round in Flat Sediments

In the accompanying sketch is shown the side-cut drift round that is used in the lead district of southeastern Missouri for driving in the flat-dipping dolomite that forms the country rock in the mines. The drifts are driven about 6½ ft. high and 8 ft. wide. Other types of rounds have been tried. In one of the mines where Leyner drills are used, the Leyner center, pyramidal cut has been tried, but it did not prove as satisfactory as the side cut. The Western drifting cut, in which the holes are drawn from the bottom with lifters to take up the bottom bench lift under the cut, has also been tried, but the side-cut has more than held its own.

Only at the mines of the Desloge Consolidated is a different cut used. There, when drifting in ore, a center V-shaped cut is used in the drift, and a drift 11 ft. wide and 6½ ft. high is driven. This cannot be advanced quite so fast as the smaller drift, but the ore coming from it is broken much more cheaply owing to the much smaller amount of dynamite used per ton of ore broken or per foot of advance.

The reason that the side-cut proves so satisfactory in this sedimentary formation is the fact that the holes, owing to flat dip of the limestone bed, are always kept in the same bed. Consequently, the holes are easier to drill and break better as they are in rock of the same character for the entire depth. Where drilled downward there is frequently a tendency for the holes to "bull-ring" through breaking out in the weaker beds and leaving the more resisting beds standing. This causes the holes that follow to break less efficiently, and the entire round is often held up when this happens.


Holes 4'-0" Deep 9 to 10 Sticks 1⅛", 35% Dynamite
Holes 4'-0" Deep 9 to 10 Sticks 1⅛", 35% Dynamite
Holes 5'-0" Deep 10 to 11 Sticks 1⅛", 35% Dynamite
Holes 7'-0" Deep 10 to 11 Sticks 1⅛", 35% Dynamite
Holes 8'-0" Deep 12 to 13 Sticks 1⅛", 35% Dynamite
3½'
4½'
Plan
8'-0"
6½'
Elevation
ENG. & MIN. JOURNAL

METHOD OF PLACING DRIFT HOLES IN DESLOGE MINES

One-man drills, chiefly 2½-in. Sullivan, are used although at one mine many Leyners are used, and a few butterfly, 2¾-in. Ingersoll-Rand drills are being introduced. Two of the one-man drills are used in a drift, one mounted on each side of a vertical column. With two drills a round can be drilled and blasted in one shift. In drifting the drilling is done only on day shift, and the machine men always have a clean shift

*Mining engineer, Great Northern Iron Ore Properties, Bovey, Minn.

to start with. A one-man machine will drill about 40 ft. of drift in average ground, taking out the time required in setting up and loading and blasting. A Leyner drill has often been known to put in a drift round in a shift with one man running it in the mines where that type of drill is used.

With this side cut, the round is alternated from one side to the other so that in about three rounds the face of the drift is squared up. A round will square up from 4 to 4½ ft. per shift, and the average speed of drifting in the district is about 90 ft. per month of 26 days. Generally from 11 to 14 holes will break a round as shown in the accompanying diagram of a drift round. About 20 lb. of dynamite per foot is used in such a drill about 40 ft. of hole in average by a round. The cost of driving is about $10 to $11 per ft., of which cost about 25% is for labor. This cost, though, only takes in the direct charges pertaining to drifting, such as breaking, shoveling, tramming, drill upkeep, air and explosives.

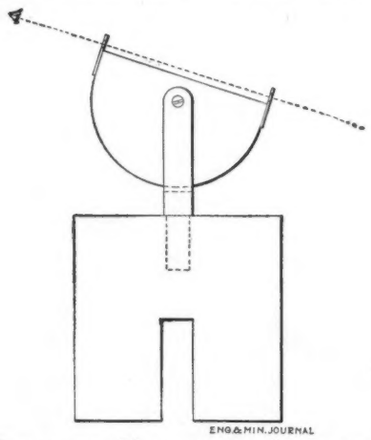
Setting Out Undergronnd Work

By H. G. Henderson*

The mining surveyor has not, as a rule, sufficient command over actual practical mining operations, his duty being to lay out the work so that the miner can follow his directions. He should not, therefore, be held responsible for any delay or damage which may occur, due to departure on the part of the operator from the directions given. Frequently it is desirable to check the work as it proceeds, to make sure that the men thoroughly understand their directions. Even where absolute control is secured, it is not always easy to cope with the ignorance or carelessness of workmen. The surveyor is frequently put to much inconvenience by the stupidity of the workmen, especially when a number of different pieces of work are in progress at the same time and it is only possible to inspect each job at distant intervals of time. The effect is to run up unnecessary expense in case of mistake, which makes the matter important.

In one case the surveyor had laid out a crosscut in a given direction, and having seen that all was well for 50 ft. he hung two plumb lines from the "back" or roof of the crosscut and then instructed the workmen how to proceed. On revisiting the works some three weeks later he found that the advanced end of the crosscut was some fifteen feet out of its proper line. He put the foreman of the gang under cross-examination and found that this man had taken up a position midway between the two sights, and as near as he could judge, in a line with them, and had used the foremost plumb line for his line of sight. Unfortunately, as might have been expected, his position was not in a straight line between the two points, and the result was that the farther the crosscut was driven, the greater the error became.

In order to prevent a mistake of the same kind in future, the surveyor took a length of straight pipe, four feet long, and suspended it from the "back" in such a way that it was rigidly supported. He then fixed nails in the front end of the tube to correspond with the cross hairs of a telescope. At the other end of the tube he inserted a wooden plug and drilled an eyehole in the center. This arrangement made a rough-and-ready telescope pointing along the proper line, which the crosscut should take. When it was necessary for the foreman to see whether the work was progressing in the right direction, he sent a laborer to the advanced end of the crosscut with a light and this was moved about until it



Device for Maintaining Alignment in Underground Work

was sighted by the foreman at the eyepiece of his telescope. This device is easily understood and is a valuable adjunct to operations which have to be carried out by more or less unskilled labor.

It cannot be too strongly impressed upon mine managers that the difficulties of the surveyor are by no means at an end when he has completed and computed his work. It is frequently necessary to contrive special means to enable the miner to carry out the work in accordance with the surveyor's directions, and it will, therefore, be of interest to describe a method employed in a large mine where it was desired to hole a rise to a shaft which was being sunk, the combined rise and sink being over six hundred feet. After a careful survey and accurate setting out of the bearing and inclination both for the rise and also for the continuation of the shaft, which was at that time eight hundred feet deep or more, it became apparent that if a successful "hole" was to be obtained, something more reliable than the ordinary plumb lines would have to be employed. In this work, although the respective bearings might be truly maintained, there was a grave danger that the contractor would not only fail to rise and sink at the necessary inclination, but might also get the shaft twisted. To prevent this, the surveyor instructed the mine carpenter to construct a wooden dial according to the following description:

A piece of hard wood about 6 in. diameter and 5 to 6 in. thick was taken, and this represented the horizontal plate of an ordinary miner's dial. A cut was then made about 3 in. deep and 1½ in. wide along the diameter of the wooden dial. On the top of this plate and at right angles both to it and the cut was fixed a piece of thin wood in the form of a quadrant similar to that of an ordinary dial, the quadrant being attached to the dial by means of a slotted wood pillar. To the quadrant were attached sights constructed of tin plate, the whole arrangement being shown in the drawing. When the surveyor had this dial finished to his satisfaction, he proceeded underground to the bottom of the shaft, and there had two small holes or niches cut in the sides at right angles to its bearing. In these holes he placed a bar of iron 1½ in. square, the holes being cut in such a manner as to insure that the bar was level and that the exact center of the bar coincided with the center of the shaft. On this bar he placed his dummy dial by fitting the bar into the cut in the bottom of the hardwood block, and this cut was made just sufficiently larger than the bar to obtain an easy fit without rocking or play of the wooden block from end to end along the bar. The quadrant of the dummy dial was then set to the required angle of the rise, which was in this case 70 deg., and was secured firmly into this position. It will be seen that a sight was given by looking through the two sight holes in the dummy dial, which would give not only the bearing of the rise and sink, but would also control the inclination. The method adopted enabled the contractor not only to check the bearing and dip of the shaft in the course of sinking, and also of the rise being put up against it, but by moving the dials as required along their respective bars, every inch of the work could be controlled and all twisting avoided. This simple piece of apparatus will, in many cases, be found to be of considerable value in mine work where comparatively unskilled labor has to be relied upon.

It was suggested by Hugh F. Marriott at a recent meeting of the Institution of Mining and Metallurgy, that the deflection of deep boreholes may in part be due to a corkscrew-like action, which, if his surmise is correct, might be remedied by using reverse rods and alternating the direction of rotation.

*Principal, Truro School of Mining, Truro, Cornwall, England.

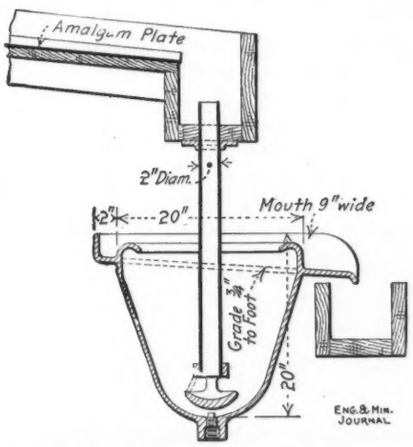
Details of Metallurgical Practice

Records of Experience in Ore Dressing, Cyaniding and Smelting

Mercury Trap for Amalgamation Tables

The mercury trap shown in the accompanying illustration was formerly used in many mills on the Rand to save any amalgam or mercury that might flow with the pulp from the bottom end of the amalgamation tables. As shown in the illustration the pulp from the amalgamation tables discharges into a transverse trough or launder attached to the lower end of the table. This launder slopes both ways towards the center, from which the pulp is drawn off through a short vertical pipe, the upper end of which extends about one inch, above the bottom of the launder and thus the launder and pipe constitute the first mercury trap.

The short vertical pipe terminates in the large cast-iron bowl shown in the accompanying illustration and described in "A Text-Book of Rand Metallurgical Practice." To the bottom end of the pipe is attached a fixture shaped like an inverted mushroom, which diverts the stream of pulp upwards. The particles of amalgam and mercury collect either in the concavity of this attachment or in the bottom of the cast-iron bowl. The overflow from the top of the bowl is collected by a peripheral launder that encircles the iron bowl and is a part of the same casting.

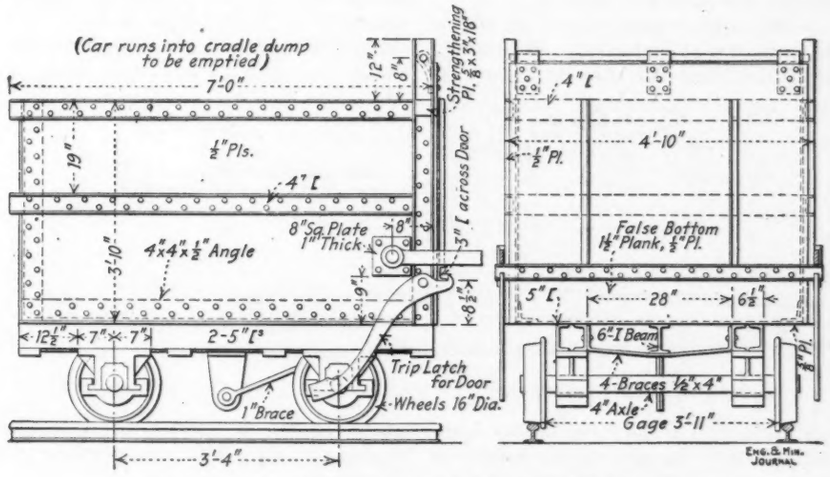


CAST-IRON MERCURY TRAP USED ON THE RAND

At the present time these bowls are not used in many of the mills on the Rand. Since the general introduction of tube milling, the escape of mercury and amalgam in particles of appreciable size has been greatly reduced, as shown by the fact that but little collects in the launder carrying the overflow of the tube-mill classifiers, and such particles are not now to be found in the sand charges. Furthermore the various cone classifiers and dewatering cones ahead of the tube mill act as efficient mercury and amalgam traps, and any amalgam that passes through the tube mill circuit, will be caught upon the shaking amalgamation tables over which the product from the tube mills is passed.

Car for Mechanical Haulage

A tram car for mechanical haulage used between the shaft and the rock house, at one of the Lake Superior copper mines, is shown in the accompanying illustration. The car is rigidly built with channel irons around the top and with channels used as stiffeners to the side and end plates to withstand the impact of ore when dumped from the mine skips. The cars are usually dumped by running into a cradle dump, several types of which have recently been described in the JOURNAL. The details of construction of the skip are apparent from the illustration.



SURFACE CAR USED AT SOME LAKE SUPERIOR MINES

At the Copper Queen mines, in 1910 it required one gallon of fuel oil to generate 86.5 lb. of steam; by increased efficiency during 1911 it required one gallon of oil for 97.5 lb. of steam. The total amount of steam generated per day was 705,969 lb. in 1910, and in 1911, 629,751 lb. per day.

Governing a Hydro-Electric Generator

The use of water to drive electric generators has now become so widely extended, especially in mining operations, that it may be interesting to refer briefly to some practical experiences in connection with hydro-electric plants. It will usually be found that such a plant runs satisfactorily, and with the apparatus which is now on the market for governing the turbine, the difficulty of maintaining constant frequency and speed even under widely fluctuating loads, has been minimized. At the same time it cannot be denied that from time to time cases arise where trouble of a very serious nature is experienced in governing due to causes which could only be discovered as a result of practical operation.

In one case there was persistent hunting in a hydro-electric set which was caused by the governor operating on small valves. These valves repeatedly became choked with silt. In order to overcome this difficulty, an attempt was made to clear the water by filters, but although they had the effect of screening off the coarser particles, no advantage was gained so far as the fine sand and mud were concerned, and without involving the outlay necessary for settling tanks, it would have been impossible to cope thoroughly with the difficulty by this means. Finally the choking became so bad that the hunting caused the governor to be knocked off, reliance thus being placed upon hand operation.

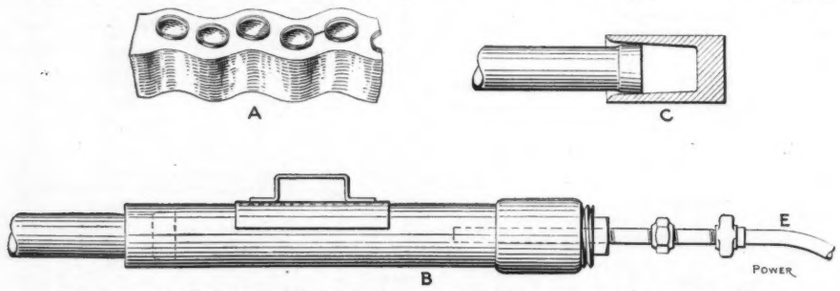
This state of things could not of course

be allowed to continue indefinitely, so an arrangement was devised and fitted which consisted of a small electric motor driven from the exciting circuit of the main electric generator, and this motor was operated by a switch controlled by the governor. The position of the governor determined the speed forward or backward or the shutting down of this auxiliary motor, and inasmuch as the motor opened or closed the bypass of the main turbine, an effective method of dealing with variations of the load was devised. Before this, nozzle governing had been adopted, but it was found that the motor arrangement proved far more satisfactory and was therefore used. This hint may be of value to other engineers in charge of water-power plants who may have been troubled with difficulties due to bad governing caused by sand or mud in the water.

Replacing a Tube Header

Mine operators using a Babcock & Wilcox boiler in mines remotely situated will be interested in the following description of a repair of a tube header, as recently described in *Power*.

A new tube header cracked as shown at *A*, in the accompanying illustration. As all the tubes were practically new, it was decided to remove the header without disturbing the tubes in the header on the opposite end. Each was temporarily blocked to retain its original position, and small holes were drilled in the header between the tubes. By driving drifts and chisels into these holes, the header was easily broken and removed.



SECTION OF CRACKED HEADER, IMPROVISED FORGE AND REDUCTION TOOL

The expanded ends of the tubes were then reduced by heating in a homemade forge, as shown at *B*. This forge was made of old pipe and fittings, and a charcoal fire supplied with compressed air through the hole *E* gave good results. The forge was placed over the tube ends until they were heated to a cherry red, after which they were drawn by placing the tube *C* over the ends and hammering it. This tube tapers slightly, and by using a coarse taper in starting and a slight taper in finishing, the work can be quickly done.

Each tube was drawn to a ring gage of the original diameter of the tube, then the new header was placed over the tubes which were expanded in the usual manner. The opposite end did not need re-rolling. This process took less time than cutting out the tubes and replacing them and both headers.

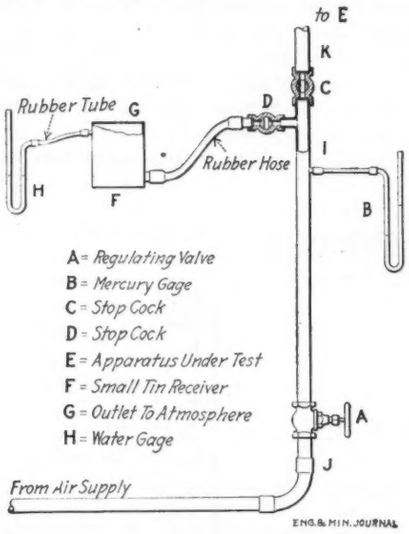
Measuring Small Quantities of Low Pressure Air

It is frequently desirable to measure the quantity of air used in metallurgical operations, as in air agitation. In order to accomplish this easily, and without resort to expensive apparatus, G. S. Weymouth, of the Great Fingall mine, has designed the apparatus shown in the accompanying illustration, as described in the *Monthly Journal* of the Chamber of Mines of Western Australia.

The method consists in substituting temporarily an equal flow of air under conditions which allow of easy measurement. The only disadvantage is that the flow of air must be diverted from the point of application for half a minute, while the measurement is being made. In the figure *A* is a valve regulating the air to the required pressure; *B* is a mercury gage; *C* and *D* are stop-cocks; *E* the apparatus under test; *F* a small tin receiver connected by rubber hose to *D*; *G* is a round orifice in a tin plate for air outlet, and *H* is a water gage with a range of about 12 in. to allow for occasional rushes of air while manipulating the cock *D*.

A low-pressure supply being required at *E* say, 5 lb. per sq.ft., and the cock *C* being open and *D* closed, the regulating valve *A* is opened until the gage *B* indicates the required pressure. The valve *A* should not be touched again during the test. The height of mercury on *B* is marked; and to measure the quantity of air flowing at this instant, the cock *D* is opened and *C* closed; *D* is then gradually closed until the gage *B* reads the same as before. In this way the total substituted resistance to the free flow of air is equal to that of the apparatus being tested, the pipe *A* to *I* in both cases acting as an intermediate receiver with constant in- and out-flow as provided by the gages. The height of the water gage is now taken, and the area of the outlet orifice noted; the cock *C* is opened and *D* closed, the gage *B* reading the same as before. This is a check on the constancy of flow during the testing period. The velocity through the orifice *G* is that due to a head of air equivalent to the pressure on the water gage, and is: $\sqrt{2gh} =$ ft. per sec., *h* being the height of the motive column (head) in feet. Reducing to inches of water, and simplifying, this becomes: $\sqrt{\text{in. water}} \times 66.1 =$ ft. per sec. The coefficient of flow for such an orifice being 0.64 owing to the contraction of the flow near the edges, the actual mean velocity over the full size of the orifice becomes: $\sqrt{\text{in. water}} \times 42.3 =$ ft. per sec.

In the author's experiments the effective velocities for an orifice of 1 in. sq. area, at pressures up to four inches water gage, were tabulated, with the corresponding discharges of cubic feet of free air per minute. All subsequent readings for different sizes of orifice were simply referred to this table. Removable screwed caps were used on the receiver, with orifices of 0.125, 0.25 and 0.5 sq.in. area, these being simple fractions of 1 sq.in.



DEVICE FOR MEASURING LOW-PRESSURE AIR

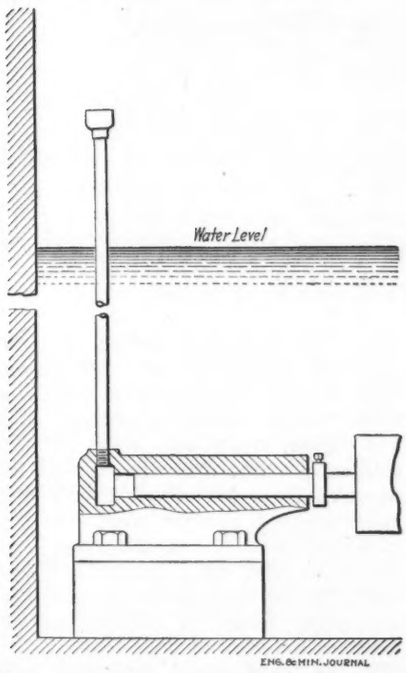
These different orifice sizes were used to keep the water-gage readings within reasonable limits, and covered all measurements up to 7 cu.ft. per minute with ⅜-in. pipe fittings. Pipe sizes do not come into the calculations, provided they are large enough to carry the quantity of air. The receiver *F* need be only of sufficient size to reduce the kinetic action of the air to a negligible quantity and give a true reading on the water gage.

In the author's actual experiments the receiver *F* was a tin of about one quart capacity. For air-lifts consuming about 50 cu.ft. per min. a 5-gal. can was used, with orifices of 0.5, 1, 2 and 4 sq.in. area. The pipe fittings in this case were 1 in. No difficulty was experienced in measuring quantities between 0.5 and 60 cu.ft. per min. By substituting a high-pressure gage at *B* readings can be taken at any pressure. A little experience soon gives the proper size of orifice to use.

An Under-Water Bearing

In the accompanying drawing is shown the details of a type of bearing for the shafts of the submerged wheels of the drag conveyors for dewatering concentrates at the Desloge mills in the lead district of southeastern Missouri.

The bearing is closed at one end, being bored from a cored casting having an enlargement cored in it at the closed end of the bearing opening. This enlargement later serves as an oil receptacle. This, in turn, connects with a hole in the center of a boss on the top side of the bearing, which is tapped at the upper end to take a ¾-in. pipe. Wings extend outward by means of which the bearing is bolted to its supports. The front of the bearing casting is faced. Side play of the shaft is prevented by a collar at each end of the shaft.



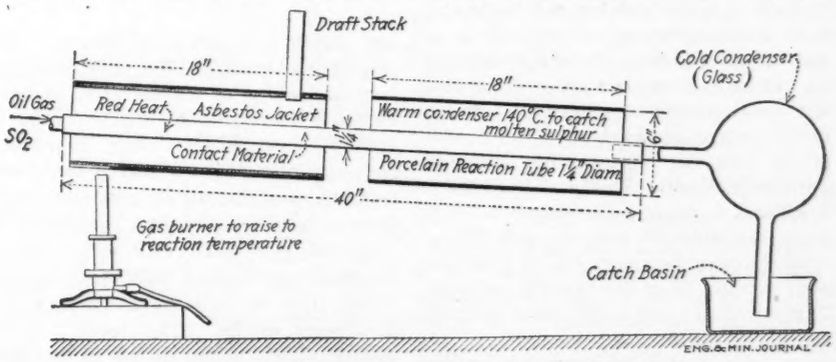
SUBMERGED BEARING FOR DRAG CONVEYOR

A pipe is screwed into the hole leading to the oil receptacle. This pipe is equipped with a reducer at its top, so as to make it easier to pour oil down the pipe. As the specific gravity of the oil is about 0.9, the oil pipe must extend above the water in the tank in which the bearing is used a little more than one-ninth of the submergence of the bearing. Then when oil is poured into the oil cup at the top of the pipe, the column of oil will be heavier than the water that is trying to work into the bearing, and the oil will work out through the bearing, washing out any grit, until finally the column of oil is just balanced by the water pressure and friction. With the two pressures balanced, and the overflow of the water kept constant, practically no grit can work back into the bearing. In this way a submerged bearing can be kept lubricated and grit be prevented from working into it. The bearing must be open only at one end to obtain the best results.

Laboratory Apparatus for Thiogen Process Tests

The apparatus employed by Prof. Stewart W. Young in laboratory tests of the thiogen process for reducing oxides of sulphur in blast-furnace gases to elemental sulphur is illustrated by the accompanying diagram. This apparatus is the same as was employed in the demonstration at Stanford University, before representatives of the Department of Justice, Bureau of Mines and copper smelters, on May 3, 1912. The construction differs materially from that of the experimental flue plant in operation at the smeltery of the Penn Mining Co. which was described in the JOURNAL of May 4, 1912. The application of the process also differs, but the results are apparently the same.

In the laboratory apparatus a porcelain tube 1¼ in. diameter, about 40 in. long, forms the reaction chamber extending through the center of two iron pipes, each about 18 in. long and about six inches diameter. The first of these iron pipes is lined with asbestos, forming a jacket to retain the reaction temperature.



LABORATORY APPARATUS FOR THIOGEN PROCESS TEST

The second pipe forms a warm condenser kept at 140° C., to catch the molten sulphur. The reaction tube is connected to a cold condenser of glass which catches the overflow sulphur. A gas burner at the bottom, near the front end of the jacket pipe, is provided to raise the heat in the porcelain tube to reaction temperature. A draft stack or pipe is attached to the top, near the front end, of the jacket. The reaction tube, which is kept at red heat, is supplied with plaster of paris as contact material.

The laboratory practice differs from that of the experimental flue in that gas generated from crude petroleum is used instead of vaporized crude, and sulphur dioxide without the accompanying gases of the blast furnace. The sulphur dioxide is first turned into the reaction chamber, and then the oil gas is turned in. The reaction chamber has been previously heated to red heat. In this chamber, in the presence of the contact material, the sulphur dioxide becomes reduced to sulphur. The greater portion of the sulphur accumulates in the warm condenser. The temperature is kept just above that of the melting point of sulphur. If this condenser is not sufficient to collect all the sulphur a portion passes on and is condensed, together with the water vapor in the cold condenser.

Lubricants and Lubricating

A grease may be defined as a plastic or soft solid which cannot be driven by pressure alone from between any two rubbing surfaces. Its resistance to shearing is small; consequently it will form thick lubricating films even when loads are heavy and speeds moderate. At high speed a grease does not compare favorably with oils, the friction resistance being much greater; hence, except for special bearings, greases are giving way to blended oils.

Greases are usually made by thickening a mineral oil, fixed oil or fat with a soap of lime, soda or lead, more or less water being emulsified with the oil and soap. In some cases solids such as black lead, French chalk and mica are also added. Greases are liable to be adulterated with excessive water and with nonlubricating solids, such as China clay and gypsum.

The corresponding property in the case of liquids which prevents them, as lubricants, from being easily pressed out, is called oiliness. This property seems to be in no way a function of the viscosity of the liquid; hence the viscosity of an oil does not furnish an index of its lubricating value. For ordinary speeds, moderate loads and good lubrication it is no doubt the degree of fluidity which principally determines the value of a lubricant for any particular purpose, but when the speeds are slow or very high, the loads great, or the lubrication imperfect, oiliness as well as viscosity plays an important part in the reduction of frictional resistance. The property of oil-

Note—Abstract of paper by Robert Jeffrey, read before the Practical Refrigerating Engineers' Association, at Houston, Tex.

iness is generally possessed most markedly by the animal oils, less so by those of vegetable origin and least of all by some mineral oils. It is on this account that fixed oils are frequently added to mineral oils, for they give the latter the property in which they are most deficient.

The viscosity of lubricants varies considerably with the temperature, so that an oil which as long as the journal runs cool is sufficient to carry the load properly, may become so fluid if the temperature rises that the rubbing surfaces tend to grip. With known animal or vegetable oils the viscosity may be used for determining the probable purity, but with the various mineral oils which have a great range of viscosity, it is necessary to specify the degree of fluidity required when ordering them.

Pure mineral oils are suitable for pressures below 70 lb. per sq.in. with free lubrication, where the surfaces in contact are such as do not readily grip one another. With increasing loads the proportion of fixed oils which it is desirable to add must also increase if satisfactory results are to be obtained as regards friction and wear.

With a good mixture the tendency to gum is checked, the oil remains fluid and cotton waste saturated with it is much less liable to fire spontaneously. Not all mineral oils can be adulterated, however. Solid hydrocarbons are present in some and when vegetable oils are intermixed the solids separate out as a precipitate and cause trouble by clogging. Often a lubricant is condemned when the trouble is not with the lubricant but with impurities accidently introduced into them. Engineers frequently go around their engines and pour oil into the ends of the bearings or even remove the oil pads and pour directly upon the bearing surfaces. This introduces grit at the point where it can easily get between the rubbing surfaces. Lubricants as given out for use should be carefully strained through wire or cotton gauze when drawn from the tank.

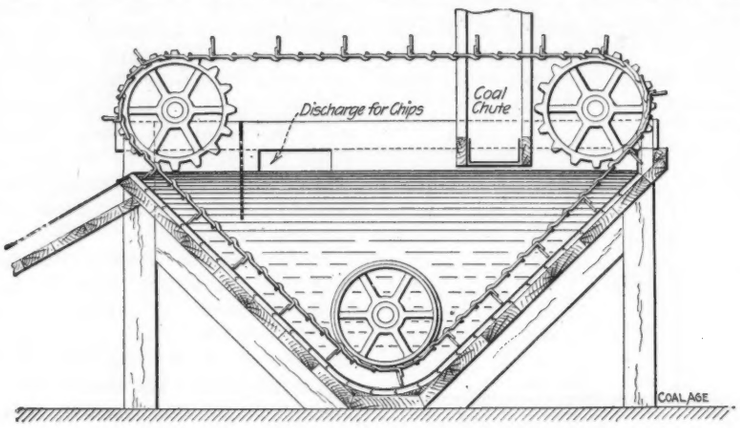
Vegetable and animal oils are unsuitable for cylinder lubrication, as in contact with steam at high temperature they undergo chemical changes resulting in the formation of fatty acids which give rise to serious corrosion. Fatty oils, however, when mixed with mineral oils in quantities not exceeding 5 to 20%, do not seem to be open to these objections and the lubrication of parts which have to carry heavy loads is greatly improved by the addition of such oils. When surface condensers are used and condensed water is again passed into the boilers, care must be exercised to prevent the passage of oils used for lubrication of the cylinders into them. Tallow, suet, castor oil and other animal and vegetable lubricants must not be used in such cases, even in small quantities, for the acids liberated by the action of heat and water vapors pass into the boilers and cause serious corrosion. These acids cannot be separated from the water by merely allowing it to rest for a time in a tank. They remain to a large extent suspended in the water, giving it an opalescent appearance.

Removing Chips from Ore

Chips of wood unavoidably become mixed with the ore from all mines and where the ore is to be milled these chips give rise to considerable annoyance because they choke screens and classifiers. The device illustrated in the accompanying sketch was originally designed for removing chips from the coal produced from the mines of the Burnside colliery of the Philadelphia & Reading Coal & Iron Co., states *Coal Age,* but there seems to be no reason why it could not be used as effectively in removing chips from ore. The apparatus consists of a V-shaped tank filled with water, and a double-strand scraper line. Coal or ore is led into the tank by a chute which terminates at the water level. It, of course, settles to the bottom of the tank and is carried up by the flights of the scraper line, being discharged over a perforated screen plate to remove the small quantity of water which accompanies it. The flights are notched and perforated to prevent their discharging a large amount of water. The chips which are brought in with the ore float on the surface. Water is being constantly fed into the tank and runs off at a rectangular opening in the side, causing a current in that direction, which carries the chips with it.

A partition of perforated screen plate is inserted just behind the forward sprockets of the conveyor line and carried down well below the surface of the water. This prevents the pieces of wood from floating over and mingling with the ore at the place where it is discharged.

The construction of the machine is simple and inexpensive, the power required is small, and the necessary water can, of course, be used over and over again, a number of times, from the point where it is discharged.



APPARATUS FOR REMOVING CHIPS FROM COAL OR ORE

Grinding Samples for Assay

It has generally been considered good practice to grind assay samples just as fine as circumstances permit, the very first grinding apparently permitting a more thorough fusion and consequently a result more nearly approximating the actual metal content of the sample. That this is not necessarily true, has been demonstrated by a large company, operating in Mexico, after a series of experiments covering a long period of time. The method of making these experiments was simply the grinding of every sample, in the ordinary routine of work, through screens of different mesh and making a duplicate assay on each different grinding. The screens used varied from 20 to 200 mesh and the experiments covered about a year. As the laboratory was an exceptionally large one, doing work for a number of mines and mills, the total number of operations was great enough to establish definite facts for the class of ore operated upon.

It was found that a maximum metal product was recovered from samples which had been ground to pass an 80-mesh screen. Those ground to pass 60- and 70-mesh were generally lower in metal product, while those ground through 120-, 150-, and especially 200-mesh screens invariably returned a less quantity of metal.

The lower results obtained on fine grinding are difficult to understand, the only satisfactory theory being that the 80-mesh grinding was sufficient to allow all the silver and gold to be acted upon during fusion while finer grinding introduced sufficient quantities of barren foreign matter, from the grinding apparatus, to materially lower the proportional metal content. The low results obtained from the coarsely ground samples are naturally explained by supposing that the coarse grains of ore were not sufficiently acted upon to recover their entire metal content.

Notes from Current Literature

Concerning Mining, Metallurgy and Industrial Chemistry

Aluminum-Cerium Alloys

That aluminum may be greatly improved by alloying with it metallic cerium in small quantities has been shown by W. Borchers, of Aix-la-Chappelle, who has been granted a patent for the process, according to London *Min. Journ.*, July 6, 1912. The ductility of the metal is increased six or seven times and its resistance to snapping doubled by alloying with it 0.1 to 0.2% cerium. When the amount of cerium is up to 0.2% the texture of the metal is firmer and denser than with ordinary aluminum, and will ring with a clear, bell-like tone. The alloy fills the finest moulded designs and is suitable for foundry work. It stands mechanical treatment well on account of its high ductility.

Rolls vs. Stamps on the Rand

The suggestion of replacing gravity stamps on the Rand with rolls has again been brought forward. James A. Yule, the new president of the South African Institution, in his inaugural address, last month, said that prior to the tube mill becoming a generally accepted unit, the gravity stamp proved to be the most economical machine for fine grinding in one operation. By elimination of amalgamation in the battery, and the adoption of the tube mill as a crushing unit, the position of the gravity stamp had been altered. He thought that two- or three-stage crushing could be introduced, the product from the last stage being cubes of ½ in. and less; this product to pass through rolls, the rolls to crush to the fineness required by the tube mills, say to pass a screen having 9 or 12 holes to the square inch. The water requirements would be reduced in such a plant, and all amalgamation would be abandoned. The capital cost of such a plant would be considerably less than that of the present-day plant, besides which, Mr. Yule contends, that there would be a great reduction in attendance, power, labor and repair costs.

Combustion of Gases

The following data, taken from *Le Genie Civil*, July 27, 1912, will prove of special interest in view of the present work on surface combustion, although it also has some significance to the ordinary uses of gaseous fuel.

The maximum and minimum calorific powers are simply upper and lower limits of trustworthy observations. The thermic power is the calories given off by the combustion of a cubic meter of a completely combustible mixture of air and gas. The speed of combustion is in a mixture of air and gas carrying 2% of oxygen in excess of that required. The temperature of the Bunsen-burner flame is that given when using the gas without preheating.

GAS COMBUSTION CONSTANTS

	Acetylene C_2H_2	Benzene C_6H_6	Ethylene C_2H_4	Methane CH_4	Hydrogen H_2	Illuminating Gas	Carbon Monoxide CO	Water Gas	Unenriched Producer Gas
Wt. in kg. per cu.m. at 0°C., 760 mm	1.162	3.486	1.252	0.715	0.089	0.52	1.251	0.86	1.26
Max. calorific power, cal. per cu.m.	13,881	36,016	14,966	9,547	3,062	5,000	3,055	2,600	1,100
Min. calorific power, cal. per cu.m.	13,398	34,566	14,000	8,581	2,578	4,600	3,055	2,400	1,060
Volumes air required in burning	11.942	35.827	14.334	9.556	2.389	5.75	2.389	2.5	1.0
Thermic power as defined below	1,035	938	913	813	760	681	901	686	530
Mean Bunsen-flame temperature, deg. C.	2,400	2,400	2,400	2,400	1,900	1,740	1,740	1,775	1,300
Speed of combustion meters per sec.	6.15	6.15	6.15	0.60	4.50	1.25	2.00	2.00	2.00
Kindling temperature in free air, deg.C.	406 to 440	406 to 440	542 to 547	650 to 750	580 to 590	580 to 590	644 to 658	644 to 658	644 to 658

Acid Resisting Alloys

It is reported that Prof. Borchers of Aix-la-Chapelle (*Engineer*, July 26, 1912), has produced alloys of iron which will resist entirely the action of acids, while the articles produced can be manipulated by the usual workshop methods. The new alloys are prepared by adding from 2 to 5% of molybdenum to an alloy of ferrochrome, which contains no carbon or very little, and not less than 10% of chromium. An alloy which contained only 36% of iron, against 60% of chromium, was found to be insoluble even in boiling nitric acid, while it possessed all the usual qualities of iron and could be worked in the usual way. Not quite such favorable results were obtained by adding titanium and vanadium.

It is claimed in *Metal Industry*, Aug. 12, 1912, that if bismuth, 2 parts; copper, 5 parts; silicon, 1 part, be melted and added to 92 parts of melted aluminum, this alloy will resist acid. [Although nothing is said to indicate it, we suppose cuprosilicon must be used.—EDITOR.]

Unique Arsenic Deposit in Corsica

For a considerable period the orpiment and realgar mine of Matra, in Corsica, has been explored (*Min. Journ.*, July 27, 1912, abstr. from *Echo des Mines*). This unique vein possesses a width varying up to 13 ft., which is remarkable for such a vein. Shafts have been sunk and levels driven so as to ascertain the fact of its continuity. The arsenic market is regulated, just at present, by the supply of mispickel, and if an important deposit of natural orpiment and realgar can be worked, instead of transforming mispickel by an expensive process into colored pigments, a great change will be effected.

Reagent for Molybdenum and Tungsten

According to Kafka (*Zeit. Anal. Chem.*, p. 482, 1912), if a drop of saturated mercurous-nitrate solution be added to a solution to be tested for molybdenum or tungsten, and then followed by one to 1.5 c.c. of concentrated hydrochloric acid and an excess of potassium iodide, and the mixture shaken until the mercurous iodide redissolves, a blue color is given by either molybdenum or tungsten. With the former, the addition of potassium thiocyanate gives a blood-red color; with molybdenum solutions too weak to give the blue coloration, an orange color, which may be extracted with ether, results on adding this reagent.

Nitrates from Atmospheric Nitrogen

In a recent article on the fixation of atmospheric nitrogen, E. K. Scott (Proc. Royal Soc. Arts, p. 645, 1912), says that no less than 200,000 hp. are now used in the Birkeland-Eyde process, while it is expected that 300,000 hp.

more will be utilized by 1916. The process has been greatly improved by the substitution of earthenware for quartz packing, thereby greatly reducing the size of the absorption towers. There are also factories operating, or in process of construction which will produce 250,000 tons per annum of calcium cyanamide.

Importance of Cuban Iron Ores

The iron-ore deposits of Cuba have increased materially in importance in the last few years, the production amounting now to more than 1,000,000 tons annually.

The *Iron Trade Review*, Aug. 22, 1912, in calling attention to this subject, gives the production for 1909 as 968,858 tons; for 1910, 1,429,349 tons and for 1911, 1,162,787 tons. The largest operations are controlled by the Pennsylvania Steel Co., with its companion company, the Maryland Steel, and the Bethlehem Steel Co. The full furnace operations at the works of these companies indicate a heavy movement of this ore over the remaining months of this year.

An interesting recent development in the Cuban ore situation is the offering and absorption of more than 200,000 tons of merchant ore from that country. This is the heaviest movement that has yet taken place in Cuban merchant ore.

The increased shipments from the Mayori deposits are supplying the Pennsylvania Steel Co., with an increased amount of high-grade mineral, this contributing to the offering of some south coast ores on the open market.

The favorable analysis of the Cuban ores, together with their proximity to Eastern works and a low customs duty, gives them some important advantages. A rebate on exported manufactures from this ore gives the manufacturers a decided advantage in bidding for foreign trade.

Solution of Gold in Cyanide

The solution of gold by potassium cyanide solution requires the presence of an oxidizing agent and is retarded or entirely prevented by the introduction of hydrogen ions into the liquid. (*Journ.* Russ. Phys. Chem. Soc., p. 567. 1912; abstr. *Journ.* Soc. Chem. Ind., July 31, 1912). Hydroxyl ions do not favor the solution and in excess may exert a retarding influence. In a neutral medium (i.e., one to which neither acid nor alkali has been added), the solution of the metal is not appreciably affected by the following oxidizing agents: quinone, sodium stannate, potassium bromate, iodate, and chlorate, mercuric cyanide, and cupric chloride, but is accelerated by potassium perchlorate, permanganate, and periodate, ammonium sulphate, sodium peroxide, potassium sulphate, sodium sulphate, bromine, potassium ferricyanide, and potassium carbonate. The relative accelerations produced by these substances in *N*/100 solutions are as follows: potassium perchlorate, 1; potassium periodate, 2; potassium carbonate, 2; ammonium sulphate, 3; potassium sulphate, 4; sodium sulphate, 4; sodium peroxide, 4; potassium ferricyanide, 5. The velocity of solution of the gold is increased by increase of the concentration of the oxidizing agent to a certain limit and may be diminished by further addition. The combined action of two oxidizing agents present together is less than that of the more effective of them. The addition to potassium cyanide of sodium chloride, mercuric cyanide, cupric chloride, or cobalt chloride has either no influence or a retarding one on the rate of solution of gold.

Protectors for Glass Stopcocks

A device to prevent glass stopcocks from slipping out and breaking, is described by W. O. Snelling (*Journ. Ind. Eng. Chem.*, August, 1912). This consists of a hard-rubber clip, the blank for which is cut from $^{2}/_{64}$-in. hard rubber in the form shown in Fig. 1. This is then softened in hot water, and bent to the desired form, which it retains on cooling. The clip is attached as in either Fig. 2 or Fig. 3. The first type is removable, the second is not.

The above device simply stops slipping out, but does not prevent loosening. To avoid this, it is suggested that glass cocks be made a little longer and a groove ground in them, into which a rubber rubber band can be slipped, as shown in Figs. 4 and 5. This is nearly invisible, out of the way of the operator, and readily removable.

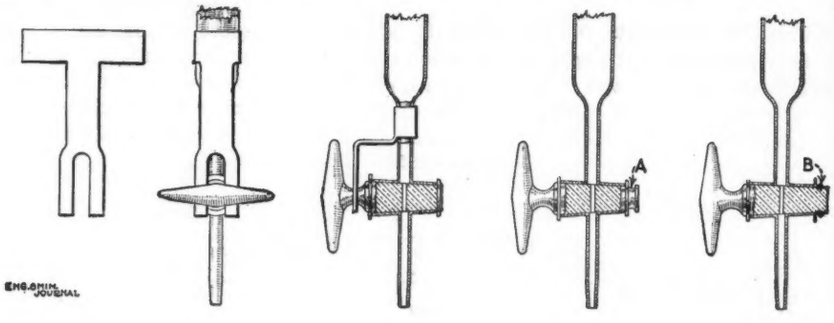


FIG. 1 FIG. 2 FIG. 3 FIG. 4 FIG. 5

PROTECTORS FOR GLASS STOPCOCKS

Constitution of Thomas Slag

According to recent researches (*Z. offentl. Chem.*, p. 221, 1912), tricalcium phosphate heated to 1100° C. largely loses its solubility in citric acid, and regains it after being melted. Consequently the most soluble product is obtained when just sufficient lime is added in the Thomas process to form tricalcium phosphate. An excess forms tetracalcium phosphate, which is insoluble. This condition may be corrected by adding silica, forming calcium orthosilicate and converting the tetrasilicate into trisilicate. The calcium silicate often dissolves metallic oxides and in consequence assumes different colors at different times.

Peruvian Bronze Axes

Analyses and micrographic investigation have recently been made on some bronze axes, of the Inca period, found in eastern Peru (*Am. Journ. Sci.*, August, 1912). The analyses of three axes were as follows:

	No. 1	No. 2	No. 3
Sn	12.03	5.58	3.36
Cu	88.06	93.94	96.44
Fe	0.08	none	trace
Ag	none	0.65	none
S	0.35	0.08	0.23
Pb	none	trace	none
	100.52	100.25	100.03

The microstructure seemed to show conclusively that the original alloy was heated to a temperature considerably over 500° C., and forged hot, or heated over 500° C., quenched suddenly and forged cold. Scleroscope tests on the edges gave: No. 1, 26; No. 2, 18; No. 3, 18; regular cast brass, 11 to 12; while a new ax carrying 12% Sn, and 88% Cu, and worked with frequent heatings above 500° C., and sudden quenching, gave 36 hardness.

Aluminum as a Substitute for Tin

Experiments made with a view to bringing aluminum to a liquid condition capable of being spread when cold, over any dry surface, have according to statements in the German press, (*Min. Journ.*, June 22, 1912), been crowned with success. The composition is applied like paint, with a brush, and gives an appearance similar to dull silver coating. It is said to be an excellent rust preventive, possessing resistance to heat up to 500° C. It is also stated to be elastic, durable, proof against atmospheric influences, and a perfect substitute for tin in plating.

A New Sulphur Operation in the South

By Richard H. Vail

The Freeport Sulphur Co. is completing a plant on the Bryan Heights "dome," near the mouth of the Brazos River, Texas, where it is proposed to produce sulphur by the hot-water process, the original Frasch patent having expired. These plans, if followed out, will have an important bearing on the industry, and break the monopoly now existing in the production of sulphur in this country. Development of other deposits may follow.

The monopoly enjoyed by the Union Sulphur Co., of Louisiana, in the production of sulphur in the United States will, it is expected, be broken this year by the commencement of operations in Texas by the Freeport Sulphur Co., which is now erecting a plant on the Texas coast, as a result of two years of exploratory work started by the Brazos Syndicate. As previously reported[1], the new syndicate backed by ample capital has acquired 10,000 acres of land at the mouth of the Brazos River, about 40 miles southwest of Galveston. The operations of this syndicate will be of much importance to Texas, but are of special interest to the mining world by reason of the development of the sulphur deposit in the Bryan Heights "dome," a low mound rising about 25 ft. above the level of the surrounding plain.

Bryan Heights Dome Favorably Situated for Economic Production

Bryan Heights is one of the characteristic "dome" formations of the Gulf Coastal Plain and is ideally situated for the economic production of sulphur, being only one-half mile from the gulf coast and within about 3½ miles of the harbor of the Brazos River, where the commercial center of Freeport is to be established.

The sulphur is to be recovered by melting *in situ* with superheated water and pumping the molten sulphur to the surface with the Pohle air-lift system—approximately the process patented by Herman Frasch, though differing in the details of its application. The original Frasch patent relating to the melting of the sulphur underground expired in 1908. A number of later patents relating to certain details of operation were taken out and some of these are still in force. Success in the use of the hot-water process by another company will have an important bearing on the sulphur industry and will doubtless stimulate the early development of other dome formations of the Gulf Costal Plain.

The Freeport Sulphur Co. is the outcome of two years' exploratory work, in which the syndicate managers state that over $150,000 was spent. After the Bryan Heights deposit was decided upon, land was acquired for a distance of 7½ miles on the west bank of the Brazos River, and the broader general plans of the syndicate were developed. These include the establishment of a port, railroad and steamship connections, the building of a bridge across the Brazos River, the laying out of the town of Freeport, the erecting of a 2000-bbl. sugar refinery, establishing a national bank, stores, warehouses, etc., besides the sulphur operation above mentioned, which in itself is an enterprise of no small proportions when all the contingencies involved in production and marketing are fully considered.

[1]Eng. and Min. Journ., Jan. 27, 1912.

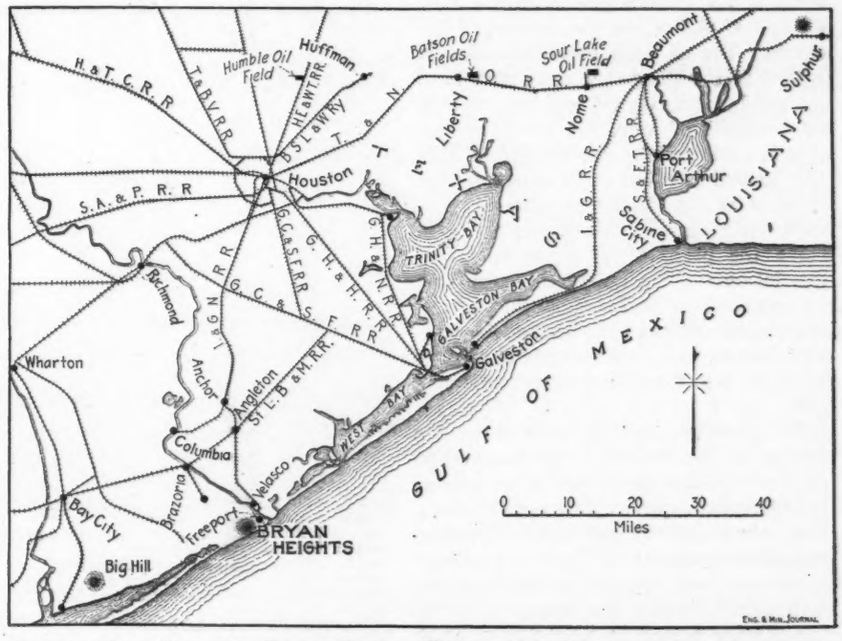
Enterprise Strongly Backed

Evidence that the syndicate is amply able to finance and manage these operations is afforded by a glance at the important names included in the personnel of its members. Among those who joined the syndicate were the following well known New York men:

F. A. Vanderlip, James Stillman and Samuel McRoberts, of the National City Bank; E. P. Swenson, of S. M. Swenson & Sons; Sidell Tilghman, of Tilghman Bros.; the late Edwin Hawley; F. Q. Brown, of Redmond & Co.; R. T. Wilson; John Hays Hammond, and A. Chester Beatty. Messrs. Vanderlip, Swenson and Tilghman have acted as syndicate managers, disbursing all funds until the various subsidiary companies were formally organized and prepared to take charge of their respective operations.

Besides the townsite company, banking corporation, etc., a terminal company will be chartered that will give free access to any railroad as well as free dockage, thus making Freeport literally a free port. The terminal company will undertake such railroad construction as may be necessary for suitable connections, and a bridge is being built across the Brazos River to Velasco to connect with the Houston & Brazos Valley R.R., in which the syndicate has an interest. It will thus connect Freeport with Angleton, 18 miles distant on the Brownsville branch of the Frisco System, and with the International & Great Northern R.R. at Anchor, 22 miles from Freeport.

As may be gathered, the operations of the syndicate will have an important effect on the commercial development of this portion of Texas. Iron-ore deposits exist within 130 miles of Freeport, this distance being almost identical with the rail haul of Mesabi iron ores to Pittsburgh. It is understood that negotiations are now in progress for the early development of these deposits for which Freeport is expected to be the outlet. Harbor improvements were begun at the mouth of the Brazos River a number of years ago; jetties were built, but the Boston company interested in the development of the Brazos country was unable to carry out its project. By removing what silt has accumulated in the river channel, a good harbor can be immediately provided.



SKETCH MAP, SHOWING THREE DOMES WHICH CONTAIN IMPORTANT SULPHUR DEPOSITS

A Large Tonnage of Sulphur in the Bryan Heights Dome

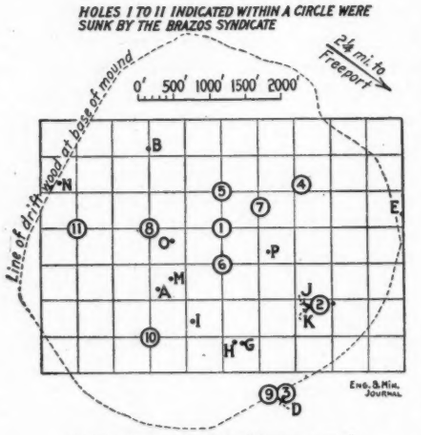
When the dome formations in the South were being drilled for oil, sulphur was encountered in a number of instances, but little attention was paid to this fact. Indeed, such deposits were of no commercial importance prior to the development of the Frasch process, and since Mr. Frasch's great success, the process has been protected by patents, none of which expired until 1908. There was consequently little inducement to determine whether any of the other sulphur occurrences were of economic importance.

Bryan Heights was drilled for oil by five different companies; about 16 holes, most of them for oil, were put down by these companies. Some gas was encountered and a little oil, but neither in commercial quantities. Logs of these holes, however, show that sulphur was encountered practically in every instance. But a single diamond-drill core remained in evidence; consequently, when the deposit was being developed by the Brazos Syndicate, 11 new holes were drilled on the dome at the various places indicated by the black circles on the accompanying sketch. Ten of these holes were drilled with a core drill, giving cores that have indicated a tonnage of sulphur running into millions of tons; the exact tonnage that is commercially recoverable is difficult to estimate but it is apparent that there is in the Bryant Heights dome a sufficiently large deposit of sulphur to be made the basis of an important commercial operation. Indeed the conditions of operation are so favorable that should the company choose to do so, it could probably compete with importers of Spanish pyrites in the manufacture of sulphuric acid.

The company does not care to supply details of the results of drilling, other than to say that about 760 ft. of gravel, "gumbo" and cap-rock were encountered; then about 150 ft. of sulphur-bearing limestone, dolomite and gypsum; there were some beds of pure sulphur varying in thickness from a few inches to 7 ft.; the sulphur ceased at from 900 to 1100 ft., being succeeded by pure gypsum and rock salt, to which no commercial importance is at present attached.

Details of an Early Drill Core

Owing to the concentration of sulphur operations into the hands of a few and the policy of secrecy that has been maintained, it has been necessary to draw from a number of outside sources for information required to round out certain details of the present situation in sulphur. Kirby Thomas, in an independent report on Bryan Heights property in 1910, gives the results of the earlier drilling, and of the No. 4 or "D" hole drilled by the Gulf Development Co. with a diamond drill. This single core may be higher or lower than the average, but as it was the most specific evidence available, it was carefully examined by Mr. Thomas, who reported as follows: "This core shows 174 ft. of sulphur formation, of which 35 ft. is limestone and gypsum, showing sulphur estimated at less than 10%; and 85 ft. of gypsum and limestone with 10 to 50% of sulphur; 54 ft. of the core is missing, which indicates that the soft friable sulphur and gypsum in this much of the hole did not core. I examined all the 120 ft. of core inch by inch and made a sight estimate by bulk that more than one-third would run 20% or better, and that about 50 ft. would run 10% or better; about 20 ft. was barren limestone or gypsum."



A to I Holes of the Gulf Development Co.
J to M Holes of the Guffey Co.
N Holes of the Reed Co.
O Holes of the Walker Co.
P Holes of the Bryan Heights Oil & Pipe Line Co.

Sketch Showing Drilling on Bryan Heights Dome

The driller's log of this hole, beginning at a depth of 818 ft., is as follows:

LOG OF WELL NO. 4—GULF DEVELOPMENT CO.

818	to	844 Limerock, sulphur and gypsum
844	to	900 Gypsum and sulphur
900	to	925 Gypsum and small amount of sulphur
920	to	925 Limerock and sulphur
925	to	960 Gypsum and traces of sulphur
960	to	988 Limerock and sulphur
988	to	997 Limerock and pyrites
997	to	1034 Gypsum
1034	to	1039 Limerock and pyrites
1039	to	1067 Sand rock
1067	to	1086 Salt rock

Note—Hole lost all water at about 915 ft. and while working the hole, a small amount of black sulphur water would flow. The rock in this hole was badly broken and considerable core was ground up, amounting in all to 62 ft.

The Freeport Steaming Plant

The first unit of a plant to have a capacity of 120,000 tons annually was designed and is now being constructed by Westinghouse, Church, Kerr & Co., of New York, under the direction of Cloyd M. Chapman, engineer in charge, and Homer Burns, superintendent of construction. The new plant will have four 750-hp. Stirling water-tube boilers which will be operated at 100% overload, delivering steam at 100-lb. pressure to three Blake jet-type marine heaters where the water that is to be pumped underground to melt the sulphur, will be heated to about 330° F. The large supply of water necessary for regular operation, approximating 2,400,000 gal. per day, will be pumped by 13 Platt Iron Works pumps. Six water wells have been driven on the flat outside of the sulphur area and other wells are being sunk to augment the present supply of water. For compressed air, there will be two Ingersoll-Rand compressors, one operating at from 350- to 700-lb. pressure and the other at 100-lb. pressure. The latter machine is to supply air for pumping water from the wells on the flat. Fuel oil will be used under the boilers and it is expected that about 900 bbl. of Tampico oil per day will be burned at the present plant. The company has erected at the mouth of the Brazos River a 55,000-bbl. steel tank, from which a 4-in. pipe line leads to the steaming plant. Affiliated interests of the Freeport Sulphur Co., own oil properties in Mexico and can deliver oil at Freeport under a very small freight charge.

Texas Operations to Begin Early in the Autumn

The Freeport Sulphur Co., expects to begin the production of sulphur early in the autumn. Benjamin Andrews will be chief engineer and the drilling of the sulphur wells will be under the direction of A. Webber; both were formerly connected with the operations at Sulphur, La. The Bryan Heights product will be taken by rail to the Freeport dock. An affiliated steamship line is to be established and in this way the company will be able to make satisfactory delivery of its product to Eastern ports.

The Sulphur Industry

The sulphur industry in this country really began with the epoch-marking process invented by Herman Frasch, for which in 1911 he was awarded the Perkin medal. This invention made possible the utilization of the deep-lying sulphur deposits of the Gulf Coastal Plain. Other sulphur deposits of the United States, such as are operated in a small way in Wyoming, Nevada and Utah, are disadvantageously situated with respect to transportation of products to other than local consuming centers. The sulphur production of the United States remained insignificant until 1903, when the Union Sulphur Co., succeeded in placing its operation in Calcasieu Parish, Louisiana, on a commercial basis, producing during the year about 35,000 tons of sulphur. Since 1904, the commercial requirements of the United States have practically been met by the Union Sulphur Co., 90% of the stock of which is controlled by Herman Frasch, the estates of H.

McK. Twombly, Abram S. Hewitt, W. H. Tiers and Edward Cooper and H. L. Severence.

Cost of Louisiana Sulphur

The cost of producing sulphur in Louisiana by the Frasch method is currently reported to be about $5 per ton at the mine. Kirby Thomas in discussing this subject in the report referred to above says: "The court records in the Louisiana State Tax case against the Union Sulphur Co., show that up to the middle of 1907, the profits of the company had been $4,545,077, on a production of 561,014 tons, including the small output of the earlier years when the process was being perfected. The selling price in New York has been maintained at about $22 per ton for some time. The mine cost of production at Sulphur, La., is reported to be about $3 per ton, but from various data it is apparently in excess of this amount, perhaps $6 per ton. The large operating expense is for fuel to heat the water introduced in the wells to melt the sulphur. The cost of installing a well was given in the Louisiana State case as $7102 and the daily cost of "steaming" $565; the average daily yield was reported at 203 tons and the average yield per well 8363 tons. The Sicilian mines have a higher cost equivalent to about $16 per ton, New York, as the conditions of operation are less favorable."

The growth of the sulphur industry in the United States is well presented in the accompanying statistics, taken from reports of the U. S. Geological Survey, showing the production of sulphur and also that of pyrites with which it is somewhat in competition in connection with the production of sulphuric acid. The statistics of the production of sulphur prior to 1904 are confused by the fact that sulphur and pyrites were reported together, the sulphur production being small at that period. The column showing the sulphur imports gives a better idea of the steady decline of the Sicilian predominance of the American market. The exports of sulphur from the United States amounted last year to over 28,000 tons, so that the United States may be said to be producing all the sulphur that it at present consumes in this form.

Sulphur Equivalent of Imported Pyrites Is about 400,000 Tons

It will be noted, however, from the tables showing the production and importation of pyrites that this country still imports a large proportion of raw materials used in the production of sulphuric acid. Pyrites is used almost exclusively for the purpose of manufacturing sulphuric acid and only about 300,000 tons are mined in this country, while over 1,000,000 tons are imported. The sulphur content of the imported pyrites is equivalent to about 400,000 tons, from which it will be seen that there might be a large field for the utilization of American sulphur should the conditions of production and transportation permit it to be sold in competition with pyrites, the price for which ranges from about 10 to 13c. per unit of sulphur.

Sulphur can undoubtedly be produced from favorably situated dome deposits using the Frasch process at prices ranging from $5 to $10 per ton delivered at the seaboard. This country has been consuming the equivalent of about 750,000 tons of sulphur annually.

Should the market for sulphur—which is principally used in the paper-making, bleaching, sulphuric-acid and powder industries and in agriculture—fail to expand with the new production, an effort will doubtless be made to invade the acid-making field, now largely held by pyrites especially where great purity is not required.

The Sulphuric Acid Field

The chief use of sulphuric acid in this country is in the manufacture of acid phosphate for fertilizer. For the making of the acid, the pure sulphur would have decided advantages over either pyrites or acid in freight charges to interior points. Thus, one ton of pure sulphur would make about 3 tons of pure acid, while one ton of pyrites will make only about 1.4 tons of pure acid; in terms of 50° H_2SO_4, the relative figures are about 4.8 : 2.3. The acid field would not be conquered in a day, however, as there are existing contracts and investments in pyrites-burning equipments that must be considered. Besides the natural inertia of the industry, there is likely to be hesitancy about installing any new equipment in this field until the possibilities of the Newberry-Fishburne calcining process—converting phosphate rock into citrate-soluble phosphate by calcination with lime or an alkaline salt—have been fully determined.

The principal sulphur producing countries of the world are, in the order of their production: Italy (Sicily), United States and Japan. Sulphur is produced in a smaller way by a number of other countries, but these operations are not of international importance. There are, however, important known deposits in various places, such as in Northern Africa, the Caucasus and Transcaspian Territory, Mexico, Chile, and in a number of islands of the Pacific Ocean.

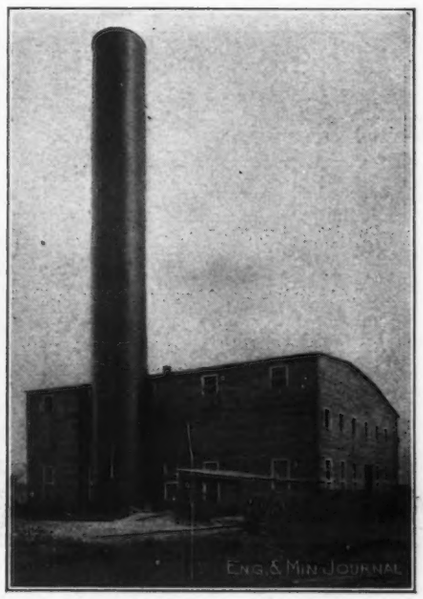
Producing Sulphur in Louisiana

In 1865, while boring for petroleum in Louisiana, a deposit of sulphur was discovered at a depth of about 500 ft. An Austrian, a French and several American companies each attempted to sink a shaft through the overlying gumbo and quicksand, but without success and with some loss of life, due to inrushing water

SULPHUR AND PYRITES IN THE UNITED STATES

year	Sulphur Production long tons	Sulphur Imports long tons	year	Pyrites Production long tons	Pyrites Imports long tons
1900	3,147	167,696	1900	204,615	322,484
1901	(a) 241,691	175,210	1901	(b) 241,691	403,706
1902	(a) 207,874	174,939	1902	(b) 207,874	440,363
1903	(a) 233,127	191,032	1903	(b) 233,127	420,410
1904	127,292	129,532	1904	207,081	422,720
1905	181,677	84,339	1905	253,000	511,946
1906	294,153	74,241	1906	261,422	598,078
1907	293,106	22,523	1907	247,387	627,985
1908	369,444	21,136	1908	222,598	668,117
1909	239,312	30,589	1909	247,070	688,843
1910	255,534	30,833	1910	241,612	803,551
1911	265,664	29,144	1911	299,904	1,006,310

(a) Includes the production of pyrites (b) Includes the production of sulphur.



Steaming Plant at Bryan Heights

CONSUMPTION OF SULPHUR IN THE UNITED STATES

Source	1908	1909	1910
	long tons	long tons	long tons
Domestic sulphur and sulphur content of pyrites	469,613	350,494	362,703
Imported sulphur	21,136	30,589	30,833
Sulphur content of imported pyrites (c)	300,653	309,979	361,598
Total domestic consumption	791,402	691,062	755,134

(c) based on average sulphur content of 45%.

charged with hydrogen sulphide. Finally, in 1890, Herman Frasch, at that time a process expert for the Standard Oil Co., applied his genius to this problem. He concluded that the sulphur could be melted *in situ* with superheated water and pumped to the surface while in molten condition. After many difficulties Mr. Frasch succeeded in putting his method in operation on a large and deservedly profitable scale. The working costs are the lowest obtained anywhere in the world, with the possible exception of the practically pure volcanic deposits, such as are mined in Japan. The latter, however, are handicapped by the high cost of transport to market.

At the presentation of the Perkin medal to Mr. Frasch, some interesting facts regarding the operation near Sulphur, La., were authoritatively announced for the first time by Mr. Frasch and other officials of the Union Sulphur Co. In view of the interest now being taken in sulphur production, it seems worth while to review some of the principal features of the Louisiana operation. At the time Mr. Frasch undertook the development of the Louisiana deposit, the dome formations of the Gulf Coastal Plain were little understood. In view of information received from the various companies, he believed that sulphur could be found anywhere in reasonable proximity to Sulphur Mine, where the land was still held at a high price in spite of the repeated failures. Accordingly he purchased land about 1½ miles from Sulphur Mine and drilled a well 2000 ft. deep without finding anything. Four wells were drilled before he reached the conclusion that the sulphur was all within the area then owned by a New York company, which was by this time glad to part with its property.

The sulphur-bearing area is nearly circular in shape and comprises about 52 acres. The wells are sunk in groups, the individual wells being placed 50 to 100 ft. apart. In the wells, a 10-in. pipe is sunk to a depth of approximately 500 ft. According to report, this hole is continued to a depth of about 630 ft., with a 9⅞-in. drill and an 8-in. perforated liner is inserted to the bottom of the hole. Then a 6-in. pipe, reduced to 5 in. through the liner and perforated at the bottom, is inserted. A 3-in. pipe, also perforated at the base, is then run to the bottom of the 6-in., and a 1-in. pipe to the bottom of a 3-in. Water superheated to 335° F. is then pumped down the outer two annular openings and after two or three days sulphur is raised through the 3-in. pipe by means of compressed air from the 1-in. pipe.

The molten sulphur is raised to a height of about 70 ft. above the surface and delivered into plank bins about 65 ft. high and usually 150 ft. wide and often 250 ft. long. Blocks of sulphur have thus been formed containing 150,000 tons. The sulphur as it comes from the wells is over 99½% pure. The output of the wells varies from 200 to 500 tons of sulphur per day, and, in one case, a single well produced over 73,000 tons. When it is desired to ship the sulphur, the planking of the bins is removed and the sulphur is blasted and loaded into cars by locomotive cranes fitted with 2-ton grab buckets. It is then sent by rail to Sabine, Tex., where dock-loading facilities permit the loading of a 7500-ton steamer in 12 hours.

About 7,000,000 Gal. of Water Used Daily

Owing to the porous nature of the sulphur-bearing rock, an enormous volume of water is required for melting the sulphur. The average daily consumption of water is about 7,000,000 gal., which is obtained from a pumping station on the Houston River, about six miles from the mine. The Union Sulphur Co. has about 130 boilers arranged in eight batteries, representing a total boiler capacity of about 25,000 hp. One of the interesting features of this large power equipment is that but a small proportion of the steam generated is used for power.

The fuel consumption amounts to about 700 bbl. of oil per day at each battery, and the average yearly consumption is over 1,000,000 bbl. In the rear of each battery are the pumps and superheaters. The latter are vertical, cylindrical receptacles, about 4 ft. in diameter and 16 ft. high, containing a series of shallow trays. The water runs over these trays and is thus brought into intimate contact with live steam from the boilers.

Operating Difficulties

When the first sulphur was melted by Mr. Frasch's process, an ordinary deep-well pump was used for bringing the molten sulphur to the surface. Much difficulty was experienced with the valves, on account of the high specific gravity of the sulphur and the corrosive action of the mineral itself. Zinc and aluminum, the only two metals not seriously corroded by liquid sulphur, proved too soft to resist the shock of the pump stroke and it was not until compressed air was successfully applied to this part of the operation that Mr. Frasch felt that commercial success had been achieved.

Other unforseen difficulties arose. Wells were lost by the parting of the pipes. As the sulphur melted out, the rocks and overlying sands would settle, the grip of the sand and earth pulling the pipe in two and the well would be lost. A 12-in. pipe, telescoping the 10-in. pipe obviated this difficulty. The life of wells was also increased by lining the hole drilled through the rock with an 8-in. perforated pipe. All wells, however, are eventually lost by caving.

Wild, cold water caused some wells to cease producing. This was first obviated by pumping in sawdust with the melting water. After pumping in about 30 cars of sawdust, one well again began producing and 39,000 tons more of sulphur was obtained before caving of the rock broke the pipes. This idea was expanded in several ways. Whenever a well breaks, the company dynamites the 10-in. pipe in the quicksand above the rock; the sand follows into the cavity and fills the space formerly occupied by the abstracted sulphur. In time, the clay of the surface slowly drops into the place of the quicksand, and, in some cases, the subsidence has amounted to 80 ft. In order to maintain the pressure necessary to prevent the superheated water from breaking into steam, the volume of sulphur extracted below must be replaced by earth. To do this a dredge with a capacity of 4000 cu.yd. per day became necessary, and its operations have resulted in numerous reservoirs on the outskirts of the property.

Interior of Steaming Plant of Freeport Sulphur Co., Showing Boilers, Heater and Pumps in Course of Erection

Sicilian Sulphur

In Sicily, which is still the most important producer of sulphur, the industry through over-production got into such a demoralized condition that six years ago it was made a government monopoly. The entire output must now be sold to the Consorzio Obbligatorio per l'Industria Zolfifera Siciliana. The statistics of production for the year ended July 31, 1911, as recently reported[2], were as follows: Total production, 391,978 metric tons; exports, 456,227; stocks on hand, 534,603 (a decrease of 61,525 tons); buying price, $17.466 per metric ton; selling price, $18.225; average cost of raw sulphur at the mines, $10.61; transport to point of shipment, $0.96; warehousing and loading, $0.96 per ton.

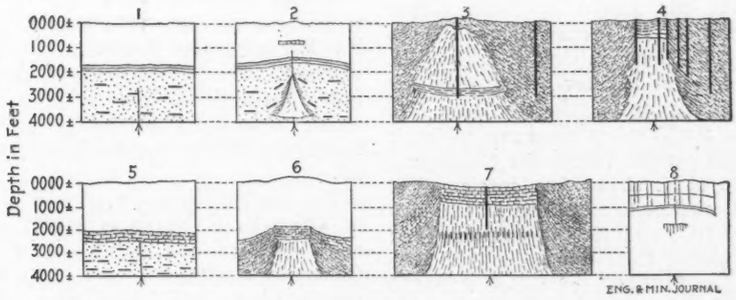
The sulphur in Sicily is found chiefly in an argillaceous limestone, associated with gypsum and bituminous marl. The sulphur-bearing rocks occur[3] in the form of immense lenses rather than as extensive beds, as this term is commonly understood. There are usually three or four layers of sulphur-bearing material of variable thickness and width. The richer deposits carry from 15 to 20% sulphur, but occasionally individual deposits are known to have 50% or even up to 80% or 90% of sulphur. Ore carrying less than 8% is not considered workable. The ore is mined in a primitive manner and is treated in a variety of ways, the greater amount being treated either in ovens or the so called *calceroni;* and a smaller amount is melted out of the ore by means of superheated steam; some ore is roasted in heaps, and the sulphur which accumulates at the bottom is collected in shallow pools. This method, however, recovers only about 33% of the sulphur in the ore. The cell oven is superseding the other methods, though the use of superheated steam is also growing.

[2]Daily Consular and Trade Reports, Aug. 21, 1912.

[3]Die wichtigsten Lagerstaetten der Nicht-Erze, by O. Stutzer; Borntraeger Bros., Berlin, 1911.

Domes of the Gulf Coastal Plain

The so called "domes" of the Gulf Coastal Plain occur in a region that is monotonous topographically and stratigraphically. The irregularities in the contour of the surface are often discernible with difficulty; some of the domes are represented by low mounds not exceeding 10 ft. in height and they are of limited area, say from 200 to 2000 acres. The rocks of the region are Cretaceous, Tertiary and Quaternary sediments which, west of the Mississippi, dip gently in a southeasterly direction. Local uplifts occur, the structure of which is well presented in the accompanying sections by Prof. G. D. Harris who has given these structures much study and from whose writings quotation has been freely made. These remarkable uplifts have been styled "domes" but this term refers to the structural rather than to the topographic feature; the newer domes along the gulf border are really domes topographically as well as structurally, but the older domes to the north are apt to be topographically plane, or even concave. It was a number of years before the existence of these quaquaversal uplifts was recognized, and their full commercial importance was not realized until Capt. A. F. Lucas who had been exploring the salt deposits of Louisiana became convinced that such domes might also contain commercial deposits of sulphur and petroleum. His theory was proved in a spectacular manner in 1901 at the Spindle Top dome where a great gusher was brought in as a result of drilling he had inaugurated. Those who disregarded this theory and drilled outside the dome failed to find the "lateral extension of this oil field," as Mr. Frasch had failed to find the extension of the sulphur-bearing area when he sunk wells 1½ mi. from Sulphur Mine.



Figures Representing the Origin of Dome Structure by Crystalline Growth—After Harris, Econ. Geol., Vol. IV

Figs. 3, 4 and 7 represent actual domes: Fig. 3, Petite Anse; note the secondary salt mass penetrated by the drill. Fig. 4, Anse la Butte. Fig. 7, Drake's Saline in northern Louisiana; a somewhat modified type of dome structure with a comparatively thick rigid layer above the salt-forming locus. Figs. 1, 2, 5 and 6 are hypothetical sections representing the early stages of dome growth; Fig. 8, calcium-sulphate deposit with secondary deposit at about 2000 ft.; hypothetical.

Origin of the Domes

The origin of the domes was a subject of much discussion by geologists and engineers who were at work in the South, prominent among whom were Hilgard, Lerch, Lucas, Veatch, Hill, Hayes, Kennedy, Hager[4] and Harris. In his 1907 report[5] to the Geological Survey of Louisiana and in a more recent contribution to *Economic Geology*,[6] Harris discussed these structures at length. The domes are considered as having formed: (1) By precipitation due to decrease in temperature; (2) by lifting the overlying rock and earth by the power of growing crystallization. On the latter point, it may be remarked, there is not complete agreement. Harris notes that the domes in the main occur at the crossing of hypothetical or actual fault lines, naturally a point of weakness that would be utilized by any gaseous or liquid substance seeking relief upward; saturated mineral solutions cooling normally at the rate of 1° C. for every 90 ft. of ascent would reach a point where they could no longer retain all the salts. He estimates the power exerted by the growing crystals as sufficient to lift 3000 to 5000 ft. of Quaternary clay and sand.

Alignment of Domes

The individual domes commonly show an elliptic plan or an alignment suggestive of common relations to some feature of general deformation. Prairie Mamou dome is on a line with the Five Islands of Louisana; Spindle Top, Sour Lake, Batson and Davis are ranged along a parallel line; High Island, Big Hill and Spindle Top form another well defined dome line.

[4]"The Mounds of the Southern Oil Fields," by Lee Hager; Eng. and Min. Journ., July 28 and Aug. 4, 1904.

[5]Bull. 7, La. Geol. Surv., 1907.

[6]Econ. Geol., Vol. IV., 1909, pp. 12-34.

Aluminum in France

The formation of the Southern Aluminum Co., and its affiliation with L'Aluminum Française has already been noted (Eng. and Min. Journ., June 22, 1912, p. 1212). Further details of the parent company now become available. The capital of L'Aluminum Française will be 17,000,000 francs, and it has acquired exclusive rights throughout the world to the Serpek process, hitherto controlled by the Société des Nitrures.

The Serpek process consists in treating alumina with air and coke in the electric furnace, forming aluminum nitride. This product is then treated with caustic soda, forming sodium aluminate and ammonia gas. From the sodium aluminate is made pure alumina, from which aluminum is made by the usual electric processes, while the ammonia is neutralized with sulphuric acid to produce ammonium sulphate for manure. The Société des Nitrures acquired the Mulhausen plant of the Swiss holders of the patent in 1910, and had experimented further at a new plant, near St. Jean de Maurienne.

L'Aluminum Française intends establishing works utilizing 40,000 hp. for this process, and it is said, will erect rolling and wire mills near Chambéry. It is hoped to reduce the cost of alumina from 200 francs to 50 francs per ton, which will mean a saving of 300 francs per ton of aluminum.

Mines in the Mogollon District, New Mexico

By W. Weston*

That an important mining camp exists in the Mogollon district in New Mexico, at the south end of the Mogollon Range, is apparently not generally known, although rich ore was discovered there in 1895. For many years after rich gold-, silver- and copper-bearing ore was discovered by Sergeant Cooney, U. S. A., then stationed at Fort Bayard, the hostilities of the Apaches prevented development, and only in late years has actual mining been done.

Production from Four Mines

Up to 1905, the production was about $5,000,000 in gold, silver and copper, mainly from four mines, the Little Fanny mine, now owned and operated by the Socorro Mines Co., the Helen Mining Co., now the Treasure Mining & Reduction Co., owning the Confidence and other claims, the Ernestine Mining Co., owning the Last Chance claim, and the Mogollon Gold & Copper Co., owning the Cooney mine.

In 1905, all the mines except the Ernestine were closed, owing chiefly to lack of transportation and the low price of metals, but in 1909 the great success achieved by Ernest Craig, chief owner and manager of the Last Chance mine of the Ernestine company, who introduced uptodate methods, machinery, cyanidation and concentration, instead of pan amalgamation, revived the whole district, and now all the mines are producing again.

Ore Lower Than $7 Not Profitable

The mines are 85 miles from the Sante Fé R.R. at Silver City, N. M., and as the general average of the ore is low, only a comparatively small tonnage was rich enough to bear the costly transportation to the smelters. As far as can be ascertained, the general average of the ores is about $20, and at present $7 ore is about the lowest that can be treated at a profit and that only with the strictest economy and uptodate appliances.

The Treasure Mining Co. has the advantage of the others in owning water power. The other companies use fuel oil for power purposes, which cost about 16c. per gal., f.o.b. mine. Lumber is $45 per M., and miners wages $3, $3.50 or $4 for machine men, and wagon freight on supplies from Silver City to Mogollon is $1 per 100 lb. The fare on the automobile line is $16, so it may be seen that costs are somewhat high.

Principal Mineral is Argentite

The Confidence and Last Chance vein, on which the Treasure company and the Ernestine company are situated, and which is about one mile in length, is a quartz, calcite vein in a shattered zone of andesite. The principal valuable minerals are argentite in the Confidence, while in the Last Chance, where rich ore is being mined 1200 ft. below the apex, the principal minerals are argentite, chloride of silver, and iron pyrite carrying gold; black oxide of manganese also shows in the rich ore. The average width of the vein is eight feet, although some of the stopes widen to 25 ft. The ratio of silver to gold is 2: 1. There are also veins in this district in which copper predominates, as for example, the Cooney vein of the Mogollon Gold & Copper Co. The mine was idle for a long time, but is producing again. In the Blue Bird vein of the Treasure company, which is adjoining parallel vein to the Confidence, a 60-ft. shaft shows fine specimens of bornite, chalcocite tetrahedrite and aburite. In 1903 and 1904 the shipments of the Mogollon Gold & Copper Co., were valued at $185,000, of which $138,000 was copper.

The Treasure Mill

The Confidence vein of the Treasure company, near Glenwood, of which Herbert Root is manager, is developed by a tunnel 2000 ft. in length with a shaft sunk 450 ft. below the tunnel level, about 80 tons per day are being sent daily to the mill on Whitewater Creek, four miles distant, by ore wagons over a good mountain road. There are 20 stamps in the mill, dropping about 105 times per minute, and crushing 4 tons per stamp through 18-mesh screens in cyanide solution, 4 lb. per ton of water. The pulp is concentrated, then cyanided. In the mill there are three Wilfley tables. The concentrates are classified in Akin classifiers, the slimes are settled in round vats, 22 ft. diameter, having continuous overflow, and the sands carried to leaching vats 24 ft. in diameter. The slimes are agitated by compressed air in vats 10 ft. in diameter by 20 ft. high. The solutions from slime and sand vats are carried direct to five zinc boxes. The precipitates are smelted in Case oil furnaces. Water delivered through a pipe line 1¼ miles long is used under 400 ft. head to develop power. There is also a steam plant at the mill.

The Ernestine company, owning the Last Chance mine, near Mogollon, and of which A. H. G. Palmer is manager, is the banner producer and original reviver of this once almost defunct district. The mine is developed by a tunnel with a mill at its portal, but a shaft has been sunk 500 ft. below the tunnel level and drifts extend from it, the lowest workings being in rich ore 1300 ft. below the apex. The mill is treating 100 tons per day. The ore is trammed to a 9x15-in. Blake crusher and then goes to the 40 stamps, 30 of them being run steadily. The ore is crushed in a solution containing about 4 lb. of sodium cyanide per ton. From the stamps the pulp goes to five standard concentrating tables. Here the heavier sulphides and raw pyrites are saved and the resulting concentrates shipped to the smeltery at El Paso, Tex. The tailings from the tables go to a Dorr classifier where the sands are separated from the slimes, the former going to a series of eight sand vats, where they are leached for about a week and then sluiced down a creek. The slimes are treated in five conical-bottom tanks, and when thoroughly agitated and decanted they then go to the Moore-process building, where the dissolved gold is extracted and the tailings sluiced down the creek, the same as the sands. The precipitates are smelted in a Steele-Harvey furnace burning crude oil.

The Socorro Mines Co., near Mogollon, of which H. F. Harris is general manager, operates the Little Fanny and Champion claims, on a vein parallel to the Confidence and Last Chance. There is an uptodate mill on the property, in which 30 stamps are dropping. The character of the ore is similar to that from the Confidence and Last Chance.

*965 Gas & Electric Building, Denver, Colo.

Universal Chemical Co.

The Universal Chemical Co. has been incorporated to proceed with the manufacture of agricultural phosphates from phosphate rock by the Newberry-Fishburne process, described in the Journal of Aug. 31. The new company is financed by Southern and New York interests, among which are White & Co., of 25 Pine St., New York. The capitalization is $30,000,000 and a bond issue of $7,500,000 has been authorized. The first plant, plans for which are now under way, will be erected in Tennessee. The announcement of the plans and the exact situation of the plant, together with the names of the officials of the company, is expected within a few weeks.

Sulphuric Acid Strengths

The strengths of the ordinary commercial grades of sulphuric acid are as follows: 50° Bé. acid contains 51.04% of SO_3 or 62.53% of H_2SO_4; 60° Bé. acid contains 63.7% SO_3 or 78.04% H_2SO_4; 66°, 79% SO_3, 97% H_2SO_4.

Costs at the Erie Mine

By S. H. Brockunier*

At the Erie mine in Nevada County, California, great economies were effected by rearranging the stamp mill, substituting mule for hand tramming, using a shrinkage instead of the square-set stoping method, and adopting more efficient drilling machinery. The costs were reduced to $1.29 per ton of ore mined and milled.

*General manager, Erie Consolidated Mines Co., Gaston, Calif.

It has been suggested that the reduction in costs of mining and milling attained at the Erie gold mine might interest others. Claim is not laid to anything original, but merely to persistence in the working out of the many problems, which were encountered.

The mine is situated in the Eureka mining district, Nevada County, Calif., and is at an elevation of 5000 ft. above sea level. The main vein lies within slate, about 300 ft. west of its contact with granite; all the veins are wide and the conditions are favorable for low working costs.

Veins are in Slate Near Granite Contact

The property was worked on a small scale in the early 60's, and in 1878 was transferred to the London & California Mining Co., which company sank the main shaft 400 ft., and operated on a more extensive scale, but upon losing the pay shoot at the lower level, operations were discontinued. Since then the property has passed through various ownerships. One of these built a stamp mill at the 500-ft. level, and drove a tunnel 1700 ft. into the mountain. None of the owners, however, connected the lower with the upper workings nor were they successful in rediscovering the lost pay shoot.

When the present company purchased the property, it found, in addition to the abandoned works, a good 20-stamp mill, the stamps of which weighed 1350 lb. each, a 12x12-in. Smith-Vaile compressor, 1¼-ton steel mine cars, three 3-in. air drills in bad condition, three small hammer-drills and the usual complement of mining tools.

The new owners planned to connect the lower tunnel with the upper workings, drain the old mine, demonstrate the possibility of an extension of the old shoot into the lower workings, to mill any ore found, and ascertain the cost of working, recoverable gold, etc. We need not dwell on the first year's operation, it was neither economical nor profitable.

When the present management assumed charge the lower and upper workings had been connected, the mine drained and some satisfactory ore had been found, but, considering the equipment and conditions, the cost of mining and milling, which was $3.60 per ton, was excessive.

The power for mine and mill was derived from pelton waterwheels operated by water under a 330 ft. head from the Bloomfield ditch. The cost of this water was 10c. per miners' inch, or about $4.50 per hp. month. The cost of hauling from Nevada City was $20 per ton, cost of sawed lumber $29 per 1000 ft., of round poles for stulls and timbers 1½c. per linear foot, lagging 2½c. each, headboards 3c. each, cordwood for heating $1.90, charcoal 15c. per bushel, blacksmith coal $45 per ton delivered, ties 2½c. each.

The mining was in soft ground, which was easily broken and handled, but the hanging wall was so tender that our foreman was afraid of it, and timbered the whole mine excessively, using square sets in the wider stopes instead of leaving pillars. Labor was largely composed of Italians and Austrians, with Americans in mill and shop and Cornish shift bosses. The pay per eight hours was: Miners, $3; helpers, carmen and surface men $2.75; millmen, blacksmiths, mechanics and shift bosses, $3.50. Board was $26 per month.

Fine Crushing Cause of Low Stamp Duty

Our first study was of the mill, which we found crushing 60 tons per day through 40-mesh screens, with a drop of 4 in., discharge of 8 in. and a recovery of 65% of the gold in the mill heads. Changing the slope of the amalgamating plates from one to two inches per foot slightly increased the saving. Screen analyses showed an excessive amount of fines, especially aggravating where so much clay was present; this was remedied by increasing the size of the screen aperture and lowering the discharge. These changes also increased the mill capacity.

The rock breaker was situated above the middle of the bin; the two outside batteries therefore received all the clay and fine rock, while the two middle batteries were fed with all the quartz and hard rock. In working this out we found that we could use coarser screens on the two outside batteries, the idea being to get the slime from the softer rock out of the battery as quickly as possible.

The final arrangement was: Six-inch drop, 100 drops per min., 5 in. discharge, 20-mesh needle-punched screens on the two outside batteries and 24-mesh needle-punched screens on the two middle batteries. With this arrangement and 12 gal. of water per min. per battery we increased the crushing capacity of the stamps to 100 tons per 24 hr., with an average saving of 80% of the gold. At times during a six-months run we attained a stamp duty of seven tons, and at other times, when the ore was well oxidized, a saving of 100% of the assay value. Both capacity and saving was of course dependent upon the character of the gangue being milled, the quality of the gold, and whether old or new shoes and dies were being used.

Results in the Mill Depended Upon Millmen

After much trouble with poor millmen we agreed to pay $3.50 and board, and thereafter secured millmen capable of keeping output and saving up to the maximum; although we did have some trouble getting men who would amalgamate dry enough for this ore; every time we put new millmen on we could detect a loss in our tailings samples.

After ascertaining what we could do in the mill, we started in to build the mine up to the mill capacity. As the ore in sight was at low ebb we had to increase our development so rapidly that this item became our heaviest burden. However, we were fortunate enough to encounter large blocks of ore, which, while low grade, seldom averaging over $3 per ton, enabled us to end the fiscal year with three months milling at full capacity, and thus reduce our total costs to a figure which promised good results.

While this work was going on we were installing concentrators, a larger compressor, replacing old bunk houses etc. In Table I is shown the total costs for the first six months, and costs per ton, excluding the construction, which was charged to capital account.

The labor during this period averaged:—

Development: 8 miners, 2 carmen, 1 blacksmith, 1 boss; total 12 men. Stoping: 8 miners, 10 carmen, 4 timbermen, 1 blacksmith helper, 1 boss; total 24 men. Milling: 3 millmen, 2 rock breaker men, 1 utility man; total 6 men. Administration: 1 superintendent, 1 foreman, 2 office men; total 4 men.

The grand total was 46 men employed. The costs given in Table I included all taxes, insurance and salaries, but nothing for amortization or sinking fund.

Many Economies Effected in the Mine

This was a fairly creditable showing, but during a shutdown of the mill, caused by a shortage of water, a large block of ore was developed, which did not average as high as the others, and a campaign was undertaken to see if $2 rock could not be made profitable.

All the ore was hand trammed, and more efficient work seemed possible in this direction. Therefore the main tunnel, which was 1700 ft. long, was selected for a study of the trammers and their methods. It was found that a man loaded a 1¼-ton car at the chute, took it out, dumped it, and returned in from 35 to 45 min., which made the cost of tramming on that level 18c. per ton. The track was then leveled, some curves reduced, cars put in good shape, and mules tried. It was found that a man and a mule got out four tons in 45 min., equivalent to a cost of 10c. per ton. Putting men back on the cars in the shift opposite the mule, selecting our men and showing them how to make time, we found that they could now make the round trip in 20 min., or at a cost of 14c. per ton. Thus we had effected a saving, by handpower of 4c. per ton and by mule power of 8c. per ton.

Similar tactics throughout the mine enabled us to reduce our force of trammers sufficiently to save a total of 20c. per ton on all ore trammed. During these experiments we found that a car which held one ton was the maximum size that one man could handle profitably on our track and grades.

A study was then made of the miner and his methods. By directing the placing of the holes to better advantage, and cutting down the amount of dynamite used, a decided saving per ton was effected. Substituting one-man butterfly-valve Ingersoll drills for our old 3-in. piston drills, not only reduced the cost of labor, but increased the rapidity of our development work. Up to this time the stoping had all been done by hand, the nature of the vein lending itself admirably to this class of work. However we decided that a great saving could be effected here, so we discarded our cheap hammer drills, which we found entirely too expensive to keep in repair, and substituted No. 8C. Waugh stoping drills. The work performed with these drills during one year's hard service has been wonderful, and the repair bill has been practically nil. By the use of these two styles of drill and persistent hammering at efficiency, we succeeded in dispensing with eight more miners and yet did quite as much work. We could easily count on 30 to 40 tons of ore per drill in the stopes and could call on the 2½-in. drill for from four to five feet per shift in drift or crosscut, which amounted to 45 ft. of hole drilled.

Shrinkage Stoping Displaces Square Sets

Finally we changed our foreman and also our method of mining, by discontinuing all square sets and substituting the shrinkage method of stoping, with only an occasional stull when the hanging would get too flat or too tender to be safe. Wherever possible we left pillars of ore to support the hanging. As soon as a stope was completed up to the next level we drew it, and allowed the hanging to cave. In work of this character it is necessary to keep the raises and drifts without the zone of caving; with our hanging wall we do not think it would be safe to stope large blocks of reserve ore, but the development can be kept far ahead of the mill. This method effected one of our greatest economies, and so far it has been unaccompanied by accident.

By taking the utility man out of the mill, and making the day rock-breaker man assist the blacksmith, we still further reduced the costs; and by eternal vigilance we reduced the force to the following:

Administration: 1 superintendent, 1 office, 1 foreman; total 3 men. Mine: 8 miners, 8 carmen, 1 blacksmith, 1 shift boss, 1 compressor man; total 19 men. Mill: 3 millmen, 2 rockbreakers; total 5 men. This is a grand total of 27 men producing 3½ tons of ore per man.

The monthly results of all these changes on a three-months' run and on the basis of 100 tons per day milled was as shown in Table II. The supplies included power etc. and the total cost was therefore $1.29 per ton, to which should be added 21c. for sinking fund and 21c. for amortization of plant making total cost per ton $1.71. These costs can be sustained in the future, except the development, which should be 35c. per ton, but it is now necessary for the company to drive a lower tunnel and open more ore reserves, which cost would be taken care of by the 21c. sinking fund. Arrangements are now being made to carry this project through and when it is done steady mining on a large scale can be undertaken.

Summarizing the net results attained on a basis of 100 tons per day were: Reduction in employees, from 46 to 27 or saving of 19 men; reduction in developing per ton, from 84 to 25c. or saving of 59c.; reduction in stoping, from $1.02 to 68c. or saving of 34c.; reduction in milling, from 46 to 36c. or saving of 10c.; a total reduction in costs from $2.32 to $1.29 or $1.03 per ton.

TABLE I. TOTAL EXPENSE AT ERIE MINE FROM JULY 1, 1910 TO JAN. 1, 1911.
(During this period of 184 days, the mill ran 130 days and 13,587 tons was milled.)

Month	Tons	Construction	Administration	Supplies		Labor		Total except construction
				Mine	Mill	Mine	Mill	
July	1,308	$2,686.20	$642.27	$1,857.83	$345.71	$1,998.12	$303.10	$5147.03
August	1,319	1,975.81	803.24	1,317.77	259.66	2,922.39	452.91	5,755.97
September	2,113	2,843.98	993.67	364.83	393.66	2,826.65	551.35	5,130.16
October	2,713	886.68	637.37	816.98	369.41	3,280.09	500.38	5,604.23
November	3,089	184.78	583.87	852.74	274.66	2,945.54	502.49	5,159.30
December	3,045	630.29	631.65	302.50	320.00	2,986.52	553.14	4,793.81
Total	13,587	$9,207.00	$4,292.07	$5,512.65	$1,963.10	$16,959.31	$2,863.37	$31,590.50
Monthly Average	32,264		$715.34	$918.77	$327.18	$2,826.55	$477.23	$5,266.08

Output milled per mill day of 24 hours, 104 tons.
Average costs per ton, distributing administration; Development, $0.84; stoping, $1.02; milling, $0.46; total per ton, $2.32.

TABLE II—EXPENSES OF THREE-MONTHS' OPERATIONS AFTER EFFECTING ECONOMIES

Operation	Labor	Supplies	Total	Per ton of Ore
Developing	$ 382.10	$ 136.80	$ 518.90	$0.17
Stoping	1350.90	486.10	1837.00	0.61
Milling	558.30	300.88	859.18	0.29
Administration	570.00	95.20	665.20	0.22
Total	$2861.30	$1018.98	$3880.28	$1.29

Gold Production of Seward Peninsula

The gold produced in Seward Peninsula, Alaska, for 1911 had a value of $3,100,000, which was a decrease of about $400,000 compared with the figures for 1910. This falling off, according to the U. S. Geological Survey, is attributable to three main causes. A decrease in the amount of winter mining; a general decrease in the number of mining operations, excepting dredging; the handling of low-grade material. All these causes may be referred more or less directly to the exhaustion of the known rich bonanzas before enterprises have been established capable of handling cheaply the large amounts of low-grade material which are known to exist on the peninsula.

Consul W. J. Yerby, of Sierra Leone, reports that through a proclamation issued by the protectorate government of Northern Nigeria, West Africa, the whole of the Nassarawa Province was declared open to prospectors on May 1, 1912.

Historical Sketch of Ocampo Mines

By Robert Linton*

The discovery of gold ore at Ocampo was made about a century ago, the tale being that an angry mule herder searching for a rock to throw at his animals picked up a piece of "bonanza." The camp was prosperous from the start and is credited with a large production.

*General manager, Sierra Consolidated Mines Co., Ocampo,, Chih., Mex.

Ocampo, the head of the district of Rayón, is about 200 miles from the city of Chihuahua, in the Sierra Madre mountains, the particular part of the range being known as the *Alta Tarahumara*. The early history of the camp—like that of most of the rich *antiguas* of Mexico—is a record of a bonanza period when fortunes were easily made without employing any but the crudest and most extravagant methods. The recent reopening of the mines by the Sierra Consolidated Mines Co. has again attracted attention to this famous old camp, and the present sketch is intended to record a few historical notes of interest regarding it.

Ore Discovered in 1818

The discovery of the mining camp was as follows: In the year 1818 there was an uprising of the Indians of Onavas and the Mayo River. They planned to massacre all the Spaniards who were living among them. In the Tacupeto Valley there lived a Spaniard, José de Herrero, a merchant and miner, whose personality had made him many friends in the neighborhood. A native of the country, José María Coronado, who had been born in Moris, and who enjoyed a high prestige among the river tribes, being certain that Herrero was in danger by remaining where he was, gave him warning and helped him to escape, accompanying him himself with his men to his old home at Moris, where Herrero then settled.

As Herrero had a taste for mining, he began investigating the possibility of opening some mines in the vicinity of the town, which was then a small and purely agricultural community. His first discovery was, however, wholly accidental. He was accustomed to pasture his mules in a large box cañon above the town, and one day when his foreman went out to bring them in, five were missing. He sent the others in by his men and started out to hunt the missing five in person. After a long search he finally came upon them, and, angry at the trouble they had caused him, he picked up a rock to throw at them. As he did so he noticed it was heavy and had a yellow, metallic appearance, and remembering that his employer was prospecting for mineral, he brought it in and showed it to him. Herrero saw at once that it was gold ore. He gave the man $50 and went with him to the place where he had found it. After some search they found the vein, which outcropped showing free gold. He named the mine "El Refugio del Rosario," and this was the original discovery of the camp.

Herrero remembered how his life had been saved by Coronado and sent for the latter to come over from Tacupeto and share his good fortune, which he did the same year. He was astonished at the richness of the mine and the activity he found there, for there were already 14 *tahonas* (the crude native mills of that time) running, and a considerable population engaged in mining. Herrero had in the few months made a fortune. From the part that he gave to Coronado the latter is said to have made as much as $3000 in a single day.

The Town of Ocampo

Balvanera Discovered by a Mule Herder

A number of mules were used in connection with this business and they were usually sent to pasture over the ridge into a cañon to the east called the Barranca de Las Cuevas, also the Barranca of the Hermit, because for some years a monk from the Cajurichic mission had lived alone in one of the caves there. It was in this cañon that the town of Ocampo was subsequently built. The mules were looked after by an Indian who used to take them down along a ridge now called the Descubridora (Discovery) or Balvánera. One day he noticed an outcrop showing *oroche*, or a mixture of native gold and silver. He communicated his discovery to a friend at El Refugio who was mining on his own account, and began quietly bringing over each day a small amount of *oroche* which was added to the Refugio product and sold as such. The secret could not be kept long, however, and soon numbers of others moved over to the Balvanera and began mining.

Chief among these was Tomás Bon, a Frenchman and an experienced miner. It was he who named the camp. After he had decided to settle there he brought in his family, and as they reached the dividing ridge and looked down into the deep barranca below them where the new mines lay, his wife exclaimed: "Jesus María! what a deep barranca!", which prompted Bon to say, "We will call it the mining camp of Jesus María," and the town bore this name until a few years ago, when it was changed to Ocampo.

Owners Could Not Buy Candles Morning the Bonanza Was Struck

The Balvanera soon began producing more ore than the Refugio, and, in consequence, the greater part of the population moved over to the vicinity of the new discovery. Soon other mines were found—Jesus María, El Rayo, Santa Ana, Santa Eduviges and Santa Juliana. The last originally comprised three mines that were worked separately, the Santa Juliana proper on the north end, the Compromiso in the middle and the Providencia on the south. Although the Santa Juliana mine eventually developed into the most important producer of the camp, the early operations were discouraging. The Com-

promiso mine yielded good profits, but the Santa Juliana, which was owned jointly by several partners, did not make expenses. The owners had about lost faith in the property, but two brothers named Ontiveras, who were Zacatecan miners, insisted that with a little more work the mine would surpass the Compromiso. But the mine had gotten into such bad repute that the owners could scarcely be induced to put more money into developing it, and it is said that on the morning of the day when the bonanza was broken into, Pedro Ontiveras had a great deal of difficulty in raising a dollar to buy candles with. This bonanza was found in 1825.

Originally Ores Were Ground in Tahonas and Smelted

At this time amalgamation was unknown here and the treatment was simply by grinding in *tahonas* and melting down in the crude melting furnaces of that time. These small treatment plants lined the arroyo and made large profits for their owners. The fame of the camp spread through the country and attracted miners who came from as far south as Zacatecas, Aguas Calientes and Jalisco. Among these was a Zacatecan who understood amalgamating and he obtained permission to treat the tailings from one of the *tahonas*, owned by Tomás Rivera. The latter was no little surprised to find that the Zacatecan with only a few days' treatment of these tailings, cleaned up 20 bars of bullion containing 16,000 oz. of silver. It is needless to say that the new process found immediate favor.

It was a period of prodigality, as was a natural result of conditions attendant upon mining such rich orebodies. While the operators made fortunes, the miners as well appear to have helped themselves quite plentifully to the abundance within reach. Many amusing stories are told of these early days. On one occasion one of the miners obtained permission to give a dance in the plaza, and in order that the plaza might be made ready for the occasion he had it washed down thoroughly, not with water, but with mescal.

By 1832 a large town had been built up, local government established, schools, business houses, churches, and at the same time the population had gained a reputation for solidity and good behavior which it retains to the present day. By that time the Santa Juliana mine had been worked down several hundred feet and being now below the level of the arroyo, a considerable flow of water was encountered. As the grade of ore had also lowered, and the cost of operations had increased with the deeper mining, the operation of the mine involved greater and greater difficulties. By 1834 work had been stopped. In this year a Spaniard named Sevilla put $25,000 into the enterprise, and the mine was actually unwatered, but another heavy flow again drowned out the workings, and the mine caved. The property was abandoned, and lay idle for over 50 years. It must be considered that at this time all the work was done by hand. No machinery had been brought in, and in spite of this the Santa Juliana mine had been worked to a depth of over 800 feet.

Santa Eduviges Bonanza Treated in Arrastres and Vasos

Meanwhile the Balvanera, Refugio, Santa Eduviges and a few smaller mines were still being worked in a rather desultory manner, and a few years after the Santa Juliana was abandoned a new bonanza was found in the Santa Eduviges. This mine was owned at that time by R. Siquieros, who packed the ore on burros to his *Hacienda Carmen* about two miles distant, where it was treated in arrastres and *vasos*. The oreshoot was large and portions of it extremely rich. It made a fortune for the owner in spite of the fact that a considerable portion of the richest ore never reached his arrastres. The shoot was called the *Plaza de Gallos* (cock-pit) because the miners were accustomed to hold cock fights there on holidays, each miner wagering his accumulation of "high grade" on the result.

First Foreign Company Formed in 1886

The mines were operated in this manner until 1886 when the first foreign company entered the camp. The Refugio Mining & Milling Co., in that year acquired the Refugio del Rosario mine and brought in the first mining machinery that was ever used here, also equipment for a 20-stamp mill. This machinery was all packed in from Alamos, about 300 miles distant, through extremely rough country. The company was composed originally of Omaha and San Francisco men, but the latter sold out after a time, leaving the Omaha men in entire control and with the active management of the operations. The advent of the Refugio company was followed by a revival of activity over the whole camp. In 1887, Carlos Conant relocated the Santa Juliana mine and organized the Santa Juliana Mining Co. Pumping and hoisting machinery was installed, the mine unwatered, and cleaned out, a 20-stamp mill built, and the property became again the leading producer of the camp. The mine was worked in this period down to a total depth of 1100 ft. The Rincón and Guadalupe mines were also acquired by this company and some ore obtained from them. In the same year that the Santa Juliana was relocated, José Dolores Solis located the San José mine and began working it in a small way. Solis died and about 1890 John J. Waterson, who had been connected with the Refugio company, leased the property and began active mining, treating the ore in arrastres at the *Hacienda de Quintana*, where the Waterson mill now stands. The operations were profitable from the start, and Waterson soon built a 10-stamp mill which a few years later was enlarged to 20 stamps. In 1902, Waterson sold the property to an English company, which still owns it, although it has not been operated for about two years.

Santa Juliana and Belen Mills, Ocampo District

The Belén mine was opened in 1892 by John R. Darroch, who organized the Belén Mining Co., composed principally of the Omaha men that controlled the Refugio company. Subsequently the ownership of the Refugio mine passed to the Belén Mining Co. The same company also acquired the Matulera mine, which had been located in 1887, but was still merely a prospect when the Belén company acquired it.

The Latest Bonanza on Santa Eduviges

Early in the '90s Senator Tabor, of Colorado, acquired the Santa Eduviges mine and spent considerable money in reopening it, and extending the work to greater depth. The results were unsatisfactory, and he sold the property to Chihuahua men. The latter had scarcely commenced work when a new bonanza was struck that yielded a handsome profit. In 1901 the Balvanera Mining Co. was formed and acquired the Balvanera, Santa Juliana, Guadalupe and Rincón mines. The company produced some bullion, but operated only a short time.

The mills of this period recovered the metals by concentration and amalgamation. The recovery must have been very low, from what few records exist, probably not over 50% to 60% was saved. The mills represented a long step in advance over the old *tahonas* and arrastres, but required high-grade ore to yield a profit in running them.

Transportation and Power Problems

The camp had reached the point where, in order to render the operation of the mines possible, costs had to be reduced and modern methods adopted. To accomplish this, transportation facilities were required, so that efficient machinery could be brought in, and cheaper power had to be provided for use in the mines and mills, which could only be solved by a consolidation of the properties. A good wagonroad was built in 1906 from Ocampo to Temósachic on the Mexico-Northwestern R.R. Some of the mines were operated on a small scale, but were closed down eventually, and when the Waterson company, which continued running until September, 1909, closed down, the camp was entirely idle for several months. The Sierra Consolidated Mines Co. had meanwhile been organized by T. F. Cole and J. B. Cotton, and purchased the most promising and important Ocampo properties, together with some others in near-by camps. This company began operations late in the same year, and has since been engaged in carrying out a comprehensive plan of development of the orebodies that have yielded such rich mines in the past. It will readily be understood that the situation demanded a radical departure from the methods of the old companies in order to place operations on an efficient and economical basis. To provide proper power the Sierra Consolidated Mines Co. has built a steam-driven electric-generating station at Durazno, situated on its timber lands (of which it owns over 80,000 acres) from which place the current is transmitted to Ocampo at 22,000 volts and distributed to the various mines and other places where it is used. A central compressing station has also been built with pipe lines extending to the mines that are now under development.

A New 100-ton Mill

The results of the development work have been sufficient to justify the installation of a new mill of 100 tons capacity, which should be in operation before the close of 1912. This mill will be the standard equipment for all-sliming cyanidation, consisting of stamps, tube mills, Pachuca agitators and Oliver filter.

Cyaniding had been introduced at El Salto mill in 1907, and about the same time also adopted by the Waterson company. The results obtained in the short time these companies continued to operate after this were much more satisfactory than had been obtained by amalgamation, and demonstrated that the Ocampo ores are readily amenable to this method of treatment.

It is, of course, impossible to make any but the most general estimate of the production of the Ocampo mines. Men who have been connected with the operations longest estimate it at around $100,000,000. The largest production was in the early days when the richest bonanzas were worked. However, recent operations, even with the inefficient machinery at hand, have yielded much bullion and this output would have been greatly increased with modern mining and milling equipment. The orebodies are persistent in depth, and no producing mine appears ever to have been closed down because the oreshoot had been exhausted.

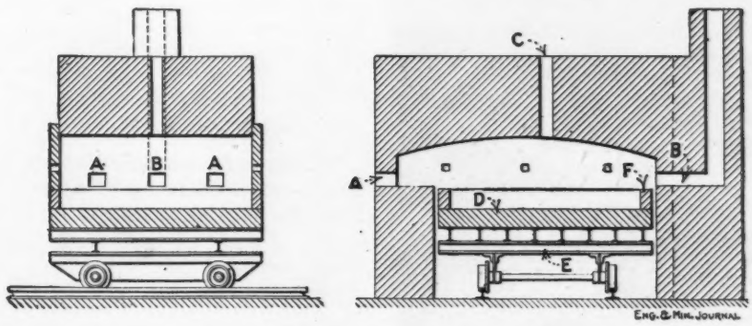
Mineral Output of New Caledonia

The New Caledonian 1911 mineral production is given by *Metaux et Alliages*, June, 1912, as: Nickel, 120,659 metric tons of ore, and about 3000 tons of matte; chrome ore, 82,806 metric tons. The blast furnaces of the Thio works were blown in in December, 1911, and the Société le Chrôme has completed a great hydro-electric installation, so that it is believed that the value of the mineral output may triple in 1912. The cobalt industry still shows no sign of life, owing to the amount of that metal recovered in Canada.

The West Sintering Process

A process for sintering iron-ore fines has been worked out by James G. West, assistant superintendent of furnaces, at the Edgar Thomson works of the Carnegie Steel Co., at Braddock, Penn. The process which recently has been patented, consists of agglomerating or sintering the fine materials while falling in a fine stream through an opening in the roof of a reverberatory furnace to a movable hearth below. The falling stream is so highly heated that the particles of ore sinter together and form a thoroughly sintered layer immediately upon falling on the hearth. The process is an intermittent one, each cycle being terminated when the movable hearth has been loaded with as deep a layer of sintered material as it can carry.

As shown in the accompanying halftone, the sintered material has a texture like a volcanic tuff, that is, it is porous or spongy. It seems to be well suited for smelting either in the blast furnace, or in the open hearth; the main object of producing these lumps of agglomerated Mesabi ores is for openhearth service.



Sections of West Ore Sintering Furnace

As shown in the sketch, the furnace consists of a roof and sides with a longitudinal vault or passage through which the trucks carrying the movable hearths, may pass. The sides of the furnace are equipped with a number of burners. *A*. A series of passages *B* in one side of the furnace connect with the stack. Extending vertically through the roof, is the opening *C*. The hearth *D* is made of suitable refractory material, supported upon the truck *E*. Each furnace is provided with several such trucks with the hearth prepared ready to be pushed into the furnace vault.

In operation, a layer of the fine ore or flue dust is laid upon the hearth, to a depth sufficiently thick to insure that the ore will not stick to the refractory bottom, the thickness of this layer being sufficient to prevent it being entirely heated to a plastic state. The furnace bottom is further prepared by building a wall *F* along the marginal edges of the top surface of the hearth. Refractory clay, stone or brick or other suitable material

having heat resisting qualities equal to those of the materials to be treated, are employed for this purpose. When the hearth has thus been prepared, it is moved into the vault of the furnace and curtain doors are lowered to cover both ends of the vault. The burners at the side of the furnace are then lighted and the furnace hearth or bottom is heated to the desired temperature, after which, the sintering operation is begun. A stream of finely divided ore or other material is caused to flow into the furnace, the material passing through the opening *C* in the top of the furnace, and is spread over the hearth in regulated quantities. A sheet or stream of finely divided solids is thus brought into intimate contact with the highly heated products of combustion within the furnace, while falling from the opening in the furnace roof to the surface of the furnace hearth or bottom. The materials are heated sufficiently to become soft or plastic so as to partly fuse

MATERIAL SINTERED BY WEST PROCESS

and stick together. The materials as deposited upon the bottom of the furnace, are spread over the surface of the hearth by means of a rabble or other suitable tool which is inserted in the openings provided for that purpose in the doors used to close the ends of the vault. In this way the materials are distributed over the hearth in a layer of approximately even thickness.

By feeding regulated quantities of the material an agglomerated mass is gradually built up upon the hearth, until the full carrying capacity of the hearth truck has been reached. Then the doors at the end of the vault are opened and the truck or hearth carrying the sintered material is pushed out, and a new truck ready for a new layer of material is pushed in and the vault doors are closed again; the process is then continued. The other truck is allowed to cool, and when the material on the hearth has become sufficiently cool, the mass is lifted from the truck and broken into pieces of the size desired for charging into the blast or openhearth furnace.

Greenside Mine, England

LONDON CORRESPONDENCE

The Greenside mine is situated about one mile from the head of Ullswater Lake, Westmoreland, on a spur of the Helvellyn Range. In the tourist season it can easily be reached from Penrith by coach and boat and in the winter season from Troutbeck station, distant about 10 miles south over a good road.

J. H. Murchinson in his pamphlet on British lead mines written in 1875 states:

A private local company has worked this mine for 50 years. There are three adits: Top, middle and lower. A continuous run of ore ground was found in the top and middle adits for a length of nearly 200 fathoms. In some places the lode has been 60 ft. wide. About 60,000 tons of lead have been raised, producing 40,000 tons of smelted lead and 600,000 oz. of silver worth £800,000 and £150,000, respectively, while the profits were £300,000.

MINE OPENED ABOUT 1769

The above figures show that one ton of galena contained 10 oz. of silver. Postlethwaite Keswick states[1]:

This mine was first opened about 120 years ago, but not extensively. The present company began operations about 90 years ago and drove several tunnels, one of which was driven 1200 ft. before the vein was intersected. The vein runs north and south with a dip to the east of 35°. There are several east and west crosscourses, which have no effect on the vein save to throw it to the west a few feet. The foot wall or "lying cheek" is fairly well defined, but there is no regular hanging wall. The gangue is quartz and a light gray felsitic rock (not unlike some of the limestones) through which strings of galena are interspersed, sometimes in the upper levels for a width of 50 or 60 ft. Of late the ore seems to be concentrated to a width of 8 or 9 ft.

At the time of my visit the main tunnel had been extended in the hill 1.5 miles and a shaft had been sunk 105 fathoms. The blacksmith shop, for the sharpening of the drills, and the repair shops, etc., are at the portal of the tunnel. Six rock drills were at work, supplied from a compressor driven by an electric motor fixed underground about two miles from the generating station. The compressor also furnishes power for pumps and small sump hoists. By reason of ample storage facilities there is no scarcity of water, not even in summer, for the generation of electricity.

The ore is loaded into cars of 20-cu.ft. capacity and hauled by an electric locomotive to the portal of the tunnel where it is dumped into open bins, into which sprays of water play and wash the ore. The coarse ore is broken by means of a Blake crusher; the fines pass through a trommel and are elevated to the jig house. The "roughs" are hauled over an incline to a Blake-Marsden crusher, through which they pass to a set of fluted rolls, and to two sets of Cornish rolls. The shells of these rolls wear well and uniformly considering that the gangue is quartz.

The product of the rolls flows to Green jigs (four-plunger type) which take the coarsest ore. All the jigs used are Greens, most of them of the three-compartment type. The trommels follow in succession, so as to carry and divert the ore into respective jigs. The "raff" is then conveyed to a separate roll crusher in No. 2 jig shed. After being treated by the jigs, the "chats" or rejects are crushed in a battery of three California stamps (400 lb.) and the pulp is treated on two Record tables, driven by a small turbine.

SLIME PLANT EFFICIENT

The slime department has of recent years, been kept well to the front, and more attention is being paid to the treatment of slime than any other branch of metallurgy. It is comparatively easy to concentrate coarse gold, silver, copper, cassiterite, blende, galena, fluorspar, barite, etc.; the losses in concentration are principally due to the slime. The management has paid much attention to the slime and has erected a new building, well constructed, well lighted well arranged, well cleaned with ample space for two additional Records.

The slime is further treated on two Luhrig tables, supplemented by six belt tables, and finally on two concave, and one convex buddle. These buddles in some places are not great favorites, on account of the endless handlings of the "seconds" or "middlings," as no matter how many times they may be treated, they are "seconds" still and nothing else. Here, however, these buddles do good work, although in the open, as they have the faculty of saving the last slime, which is most difficult to treat, and concentrate it to 80% lead.

Slime galena is rather difficult to treat and there is no machine, no matter how carefully handled that can save all. Good machinery and skilled attention will do much to minimize loss. Galena has a high specific gravity, usually much higher than the associated minerals, yet it floats, and a few pounds in a creek or river have the faculty of making much display, like the proverbial "gilt on the gingerbread."

The crude ore from the mine carries 7.5% of lead and is dressed up to 82% for the smelter. The jig screens vary from ⅛-in. holes to No. 26 conical punched copper sheets (Cornish gage).

[1] "Mines and Minerals in the Lake District," 1889.

The ore after it leaves the crusher is automatically treated, gravitating from one machine to another, and from one department to another, so that but little labor is required. The mill is built on the slope of a hill. But little water is used for the concentration, although plenty is available. The capacity of the mill is 60 tons per day of 12 hours, concentrating 1850 tons per year to an 82% product.

The Smeltery

The smelting works is situated in the midst of the dressing department, and has a capacity of about 12 tons of smelted lead every 24 hours. A reverberatory furnace to drive off the sulphur in the concentrates is in operation 24 hours per day. There are four Scotch-hearth furnaces of limited capacity compared with the big furnaces of 500 or more tons capacity which may be seen at work in other countries. The furnace flue is over a mile in length, and is on the hillside with no pasture or much vegetation to destroy. The flue is provided with manholes conveniently placed so that when there is an accumulation of flue dust a stream of water is directed into the flue, and the dust washed into rectangular pits or tanks, just below and adjoining the smeltery floor. Overflow tanks are arranged so as to allow the flue slime to dry preparatory to smelting. It was estimated that the flue dust awaiting treatment contained 100 tons of smelted lead. This lead commands a ready sale, one firm having bought the output for many years.

Electric Plant

The first electric plant erected in 1891 was a 600-volt, direct-current type. This has since been replaced by an alternating-current plant of 2000 volts. The current is transformed inside the mine, two miles from the generating station, to 600 volts supplying power to two large hoists, two pumps, the air compressor for the rock drills as before mentioned and a motor generator for the use of the locomotive for a 250-volt circuit, through two overhead conductors fixed to the roof of the adit. The pumps and hoists were the first electrically driven machines ever fixed in any metalliferous mine in this country, and the electric locomotive still holds that record and has been at work since 1893, drawing a load of 12 trucks averaging 18 tons.

I am much indebted to the manager, W. H. Borlase, for giving permission tc go over the mine and for providing the data, also to the assistant, Mr. Grenfell, for showing me over the works.

A crystal of spodumene (lithium-aluminum silicate) was found in the Etta mine, Black Hills, S. D., which was 42 ft. long, with a cross-section of 18 feet.

Platinum Electrodes of Light Weight

Owing to the high price of platinum, Gooch and Burdick, of Yale University, have been directing their attention to substitutes for platinum electrodes (*Am. Journ. Sci.*, August, 1912). The ordinary method for making gas electrodes does not produce sufficiently adherent platinum films on the glass to use for wet analysis. A more closely adherent film may be obtained by applying a viscous mixture of glycerine and dry chlorplatinic acid with an asbestos swab to glass previously raised to a temperature sufficient to volatilize the glycerine immediately. The resulting film of metal is then burned into the glass at the softening point of the latter.

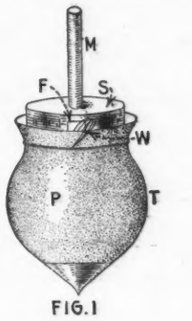


FIG. 1

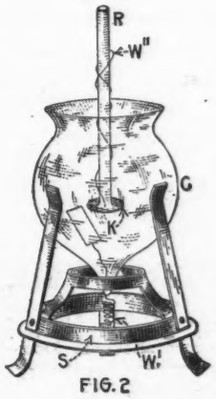


FIG. 2

FIG. 3

ENG. & MIN. JOURNAL

Electrolytic Apparatus

The best electrodes made in this manner were obtained by platinizing the outer surface of the thistle of a lead-glass thistle tube, 3.5 cm. in diameter. This is slipped on a rubber stopper carried by the shaft of a motor and is used as a rotating cathode.

In the accompanying illustration, Fig. 1, *T* is the thistle, with platinum coating *P*. *W* is a wire making electric connection with the platinum film, with *F*, a piece of platinum foil, which in turn makes connection with the motor shaft, which carried the current for deposition. Good contact between the wire and foil is obtained by squeezing them between the stopper and thistle tube. The anode is a piece of platinum foil, and electrolysis is carried on in a 50-c.c. beaker.

While results obtained with this apparatus were good, there was a tendency for the film to disintegrate during cleaning, and possibly also during deposition, as the results were slightly low.

Electrolysis in a Weighable Cell

Better results were obtained by using a weighable cell, as shown in Fig. 2. *A* is a small piece of platinum foil for anode, *W'* its connection, *C* is the cathode consisting of a disk of platinum gauze or foil, 1 cm. square, carried by a rod of glass, *R*, fused into the meshes of the platinum or into a central hole in the foil, an arrangement which gives great rigidity without the use of much platinum. The electrical connection is made to the motor shaft by wire *W''*, after clamping the class rod to it. The stand *S*, of spring brass, holds the cell during electrolysis. A similar one, of aluminum, holds it on the balance pan.

In using this apparatus the cell is washed, dried and weighed. The material for analysis, not over 15 c.c. in bulk, is placed inside, and the solution electrolyzed while rotating the cathode at about 300 r.p.m. The thistle is covered by a split watch glass during electrolysis. In experiments about ⅛ gram of copper was electrolyzed in 20 min., using about two amperes.

At the end of the electrolysis the cathode was disconnected from the shaft, and washed in the cell. Any loose particles are allowed to settle, the spent electrolyte decanted, and the deposit washed by decantation, and cell, electrodes and deposit weighed.

Weighable Cell with Filter

However, it was difficult to wash by decantation without loss, so a new piece of apparatus was devised. This is a filter tube, Fig. 3, made by fusing the end of a lead-glass tube to a little disk of platinum foil perforated by a sharp point, the rough edges of the perforations being turned outward. By applying the suction of the filter pump to the open end of the tube, and dipping the disk end into an asbestos emulsion, an asbestos felt is deposited upon the perforated disk. The tube and filter can be dried, and even ignited without difficulty.

The filter is dried and weighed with the cell, and the electrolysis performed. The liquid is then drawn off through the filter, and the deposit washed. Stand, cell, cathode and filter are then dried and all weighed together. There is not over 1.1 gram of platinum used in the apparatus.

While it can be used as a non-rotating device, the results are more reliable, and more quickly obtained when the cathode is rotated.

The Mining Index

A Classified Bibliography of the Current Literature of Mining and Metallurgy

This index is a convenient reference to the current literature of mining and metallurgy published in all of the important periodicals of the world. We will furnish a copy of any article (if in print), in the original language, for the price quoted. Where no price is quoted, the cost is unknown. Inasmuch as the papers must be ordered from the publishers, there will be some delay for foreign papers. Remittance must be sent with order. Coupons are furnished at the following prices: 20c. each, six for $1, 33 for $5, and 100 for $15. When remittances are made in even dollars, we will return the excess over an order in coupons, if so requested.

COAL AND COKE

19,683—ACCIDENTS from Explosives in 1911. (Colliery Guardian, June 28, 1912; 1¼ pp.) 40c.

19,684—AIR—Notes on the Analyses of Mine Air Conducted at the Lewis Merthyr Consolidated Collieries, Ltd., Trehafod. J.W. Hutchinson and Edgar C. Evans. (Colliery Guardian, July 19, 1912; 2¼ pp., illus.) Paper before So. Wales Inst. of Engrs. 40c.

19,685—BOILER CHARGING—Die Kesselbekohlanlage der Zeche Zollern II der Gelsenkirchner Bergwerks A. G. Pietrowski. (Zeit. des Vereines Deutsch. Ing., July 20, 1912; 4 pp., illus.) Coal-feeding plant for the boilers of Zollern II Colliery of Gelsenkirchen M. Co., Westphalia.

19,686—BRITISH COLUMBIA—Notes on the Groundhog Coal Basin, Skeena District, B. C. G. S. Malloch. (Trans. Can. Min. Inst., Vol. XV, Part 1, 1912; 3 pp.)

19,687—CHINA—Coal Mining in Northern China. J. L. Dobbins. (Mines and Minerals, Aug., 1912; 3¼ pp., illus.) 20c.

19,688—COAL CUTTING—Power Consumption of Coal Cutters. G. W. Thomas. (Mines and Minerals, Aug., 1912; ¾ p.) 20c.

19,689—COKE—Die Entwicklung der Koksdarstellung auf den Steinkohlenbergwerken in der Grafschaft Schaumburg. Finze. (Preus. Zeit. f. B. H. u. S., 1912, Part 2; 23 pp., illus.)

19,690—COKE—Improved Coke-Oven Practice. (Mines and Minerals, July, 1912; 1¼ pp., illus.) Use of crushed coal, electric pullers and loaders and leveling machines. 40c.

19,691—COKE—The Kros Regenerative Coke Oven. Alfred Gobiet. (Coal Age, July 20, 1912; 2 pp., illus.) 20c.

19,692—COKE OVEN—The Muller By-Product Coke Oven. Eugene B. Wilson. (Mines and Minerals, Aug., 1912; 2¾ pp., illus.) A description of the construction and operation of an improved coke oven possessing a number of novel features. 40c.

19,693—COKE-OVEN GASES—Ueber die Prufung des Kokerei-Rohgases auf seinen Gehalt an Nebenerzeugnissen. E. Jenkner. (Stahl u. Eisen, July 11, 1912; 4 pp., illus.) Testing of crude gases from coking ovens for by-products. 40c.

19,694—COKE-QUENCHING and Loading Devices. (Coal Age, Aug. 3, 1912; 1 p.) 20c.

19,695—COLORADO—Central Coal Fields in Colorado. F. W. Whiteside. (Coal Age, July 6, 1912; 3¼ pp., illus.) 20c.

19,696—COST OF MINING—The Increased Cost of Mining Anthracite. W. D. Owens. (Mines and Minerals, Aug., 1912; 1¼ pp.) A comparison of the present mining conditions with those existing thirty or more years ago. 20c.

19,697—DEPOSITION—An Occurrence of Coal Which Bears Evidence of Unusual Conditions Accompanying Its Deposition. Jesse E. Hyde. (Journ. Geol., May-June, 1912; 15 pp., illus.) Describes a unique occurrence of coal at Sommerset, Ohio. 60c.

19,698—DRILLING—L'Emploi des Marteux Pneumatiques dans L'Exploitation des Mines de Houille. A. Jacquelin. (Bull. Soc. des Ingenieurs Civils de France, May, 1912; 34 pp., illus.)

19,699—DUST—History of Coal-Dust Explosions. Eugene B. Wilson. (Mines and Minerals, July, 1912; 7 pp.) 40c.

19,700—ELECTRICITY in Brown Coal Mines. (Coal Age, Aug. 3, 1912; 3¼ pp., illus.) 20c.

19,701—ENGLAND—Das Kent-Kohlenfeld, seine stratigraphischen und tektonischen Verhaltnisse im Vergliech mit denen des westphalischen Steinkohlengebietes. Krusch. (Gluckauf, July 6, 1912; 8¼ pp., illus.) 40c.

19,702—ENGLAND—New Coal Field in Kent, England. (Coal Age, June 29, 1912; 1¼ pp., illus.) 20c.

19,703—EXPLOSION—The Hastings, Colo., Mine Disaster. F. W. Whiteside. (Coal Age, July 6, 1912; 2¼ pp., illus.) 20c.

19,704—EXPLOSIONS—Mitteilungen über einige der bemerkenswertesten Explosionen beim preussischen Steinkohlenbergbau im Jahre 1911. (Preus. Zeit. f. B. H. u. S., 1912, Part 2; 6 pp., illus.) Notes on some of the most remarkable explosions in Prussian coal mines during 1911.

19,705—FIREDAMP—Refraction of Light in Firedamp. O. H. Hahn. (Coal Age, July 27, 1912; 1¼ pp., illus.) Discussion of an instrument used for detecting minute percentages of firedamp, and based on the difference in the refraction of light when methane is present. 20c.

19,706—FIRST AID in Alabama Mines. J. F. Smith. (Mines and Minerals, Aug., 1912; 1 p., illus.) 20c.

19,707—GAS—Detection of Gases in Mines. G. J. Rollandet. (Min. Sci., May 30, 1912; 1¼ pp., illus.) Invention of Messrs. Turquand and Gray. 20c.

19,708—GAS—Testing for Fire-Damp and Black-Damp. (Trans. Min. Inst. of Scotland, June 15, 1912; 17¼ pp., illus.) Discussion on paper by Henry Briggs, previously indexed.

19,709—GAS—The Smith Gas Pump. W. Bert Lloyd. (Mines and Minerals, July, 1912; ¾ p., illus.) 20c.

19,710—GOVERNMENT COAL PURCHASES under Specifications, with Analyses for the Fiscal Year 1909-10. George S. Pope. (U. S. Bureau of Mines, Bull. 41, 1912; 71 pp.)

19,711—IMPURITIES—Further Notes on Coal Impurities. William B. Phillips. (Coal Age, July 27, 1912; 1¼ pp.) 20c.

19,712—LOW-GRADE FUEL—Ausnutzung minderwertiger Brennstoffe auf Zechen des Oberbergamtsbezirks Dortmund. Bütow and Dobbelstein. (Gluckauf, July 13, 1912; 1¼ pp.) Utilization of low-grade fuel at collieries of Dortmund mining district; fourteenth article of series. 40c.

19,713—MINE CARS—Colliery Mine Car Construction. (Coal Age, July 27, 1912; 2¼ pp., illus.) 20c.

19,714—PEAT—An Uptodate Peat Plant. L. B. Lincoln. (Journ. Am. Peat Soc., Apr., 1912; 8 pp.)

19,715—PEAT BRIQUETTING. G. J. Mashek. (Journ. Am. Peat Soc., Apr., 1912; 7¼ pp.)

19,716—SPITZBERGEN—Coal and Coal Mining in Spitzbergen. A. Udhaug. (Iron and Coal Tr. Rev., June 28, 1912; 1 p., illus.) 40c.

19,717—STORAGE—A Submerged Coal Storage Pit at Omaha. (Eng. Rec., June 15, 1912; 2 pp., illus.) 20c.

19,718—TROLLEY LINES—Design of Mine Trolley Lines. E. L. Cole. (Coal Age, June 29, 1912; 2¾ pp., illus.) 20c.

19,719—VENTILATION—Proposed Ventilation System. Thomas Davies. (Coal Age, July 13, 1912; 1¼ pp., illus.) 20c.

19,720—WASHERY PLANT CONTROL. G. R. Delamater. (Coal Age, July 20, 1912; 1¼ pp., illus.) 20c.

COPPER

19,721—ALASKA—The Chitina Copper District. Fred H. Moffit. (U. S. Geol. Surv., Bull. 520-C, 1912; 3 pp.)

19,722—ANALYSIS—Copper Determination with Revolving Anodes. Frank H. Probert. (Eng. and Min. Journ., Aug. 17, 1912; 1¼ pp., illus.) 20c.

19,723—ANALYSIS—Iodide Method of Copper Assay. Thorington Chase. (Mines and Minerals, June, 1912; 1 p.) 40c.

19,724—ANALYSIS—Iodometric Copper Titrations. K. Sugiura and P. A. Kober. (Journ. Am. Chem. Soc., June, 1912; 4 pp.) 60c.

19,725—GERMANY—Das Kupferzvorkommen im untern Glindetale bei Niedermarsberg (Stadtberge) in Westfalen. Boden. (Gluckauf, June 15 and 22, 1912; 15¾ pp., illus.)The occurrence of copper ore in the Lower Glinde valley near Niedermarsberg, Westphalia. 40c.

19,726—LAKE SUPERIOR—Copper Mining at Lake Superior. Claude T.Rice. (Eng. and Min. Journ., July 20, 27, Aug. 3, 10, 17 and 24, 1912; 24 pp., illus.) 60c.

19,727—LEACHING Applied to Copper Ore. Cost of Electrolytic Extraction of Copper from Its Ore. W. L. Austin. (Mines and Methods, July, 1912; 3¼ pp.) Twentieth article of series. 20c.

19,728—MATTE SMELTING—Basisches Verschmelzen von Kupferstein. Haakon Styri. (Metallurgie, July 8 and 22, 1912; 9¼ pp.) Basic smelting of copper matte. 40c.

19,729—NEW MEXICO—Holdings and Operations of the Savanna Copper Co. Chas. A. Dinsmore. (Min. and Eng. Wld., June 29, 1912; ¾ p.) 20c.

19,730—ONTARIO—Diamond Drilling at Point Mamainse, Province of Ontario. Alfred C. Lane. (Can. Dept. of Mines, Mines Branch, Bull. 6, 1912; 66 pp., illus.)

19,731—QUEBEC—The Copper Deposits of Eastern Quebec. John E. Hardman. (Can. Min. Journ., July 1, 1912; 1¼ pp.) 20c.

19,732—QUEBEC—The Weedon (McDonald) Mine, Weedon, Quebec. (Can. Min. Journ., July 1, 1912; 1¼ pp.) 20c.

19,733—REFINING—Ueber Entfernung resp. Verschlackung der Beimengungen des Kupfers im Kupferraffinierbetrieb. W. Stahl. (Metallurgie, June 8 and 22, 1912; 12 pp., illus.) 60c.

19,734—TESTING—Behavior of Copper Under the Impact Bending Test on Nicked Bars. H. Baucke. (Proc. Int'l Assn. for Testing Materials, June 1, 1912; 13 pp.)

GOLD DREDGING

19,735—CALFORNIA—The Union Dredge at Folsom, Calif. Lewis H. Eddy. (Eng. and Min. Journ., Aug. 10, 1912; 2¼ pp., illus.) 20c.

19,736—GOLD DREDGING Up to Date. Arthur Lakes. (Mines and Minerals, July, 1912; 4¼ pp., illus.) History of the rise of dredging in America—costs and conditions in various regions. 40c.

19,737—MONTANA—The Magpie Dredge, Montana. Lewis H. Eddy. (Eng. and Min. Journ., Aug. 24, 1912: 2¼ pp., illus.) 20c.

GOLD AND SILVER—CYANIDATION

19,738—COBALT—Buffalo Mine and Mill, Cobalt. W. J. Dobbins and H. G. S. Anderson. (Eng. and Min. Journ., Aug. 3, 1912; 5¼ pp., illus.) 20c.

19,739—CYANIDING TROUBLES and Remedies. Herbert A. Megraw. (Eng. and Min. Journ., Aug. 17 and 24, 1912; 9¼ pp.) 40c.

19,740—FILTER—The "Clam Shell" Filter. Ernest J. Sweetland. (Met. and Chem. Eng., Aug., 1912; 2¼ pp., illus.) 40c.

19,741—LIME IN CYANIDATION. C. E. Rhodes. (Eng. and Min. Journ., Aug. 10, 1912; 1¼ pp.) Describes practice at the mill of the El Oro Mining & Ry. Co. 20c.

19,742—LIME IN CYANIDATION. Practice at Goldfield Consolidated Mill. J. W. Hutchinson. (Eng. and Min. Journ., July 27, 1912; 1 p.) 20c.

19,743—MEXICO—Veta Colorada Mill and Cyanidation Plant. Bernard MacDonald. (Min. and Sci. Press, July 6 and 13, 1912; 7¼ pp., illus.) 40c.

19,744—PRECIPITATE—Smelting and Refining Zinc-Box Precipitate. (Min. and Sci. Press, July 13, 1912; 1¼ pp.) Comments on a previous article by M. W. von Bernewitz. 20c.

19,745—PYRITIC ORE—Cyanidation of Pyritic Ore. F. B. Reece. (Min. and Sci. Press, July 20, 1912; ¾ p.) 20c.

19,746—SOLUTION—Regeneration of Cyanide Solution. W. D. Williamson. (Min. and Sci. Press, July 13, 1912; ¾ p.) 20c.

19,747—WEST END CONSOLIDATED MILL, Tonopah. J. P. Hart and H. L. Williams. (Eng. and Min. Journ., July 27, 1912; 4 pp., illus.) 20c.

GOLD AND SILVER—GENERAL

19,748—ALASKA—Gold Deposits near Valdez, Alaska. Alfred H. Brooks. (U. S. Geol. Surv., Bull. 520-D, 1912; 27 pp., illus.)

19,749—ALASKA—Gold Deposits of the Seaward-Sunrise Region, Kenai Peninsula, Alaska. Bertrand L. Johnson. (U. S. Geol. Surv., Bull. 520-E, 1912; 47 pp., illus.)

19,750—ALASKA—Gold Placers of the Yentna District, Alaska. Stephen R. Capps. (U. S. Geol. Surv., Bull. 520-F, 1912; 32 pp., illus.)

19,751—ALASKA—Headwater Regions of Gulkana and Susitna Rivers, Alaska. With Accounts of the Valdez Creek and Chistochina Placer Districts. Fred H. Moffit. (U. S. Geol. Surv., Bull. 498, 1912; 82 pp., illus.)

19,752—ALASKA—Mining and Water Supply of Fortymile, Seventymile, Circle, and Fairbanks Districts, Alaska, in 1911. E. A. Porter and C. E. Ellsworth. (U. S. Geol. Surv., Bull. 520-H, 1912; 64 pp., illus.)

19,753—ALASKA—Notes on Mining in Seward Peninsula, Alaska. Philip S. Smith. (U. S. Geol. Surv., Bull. 520-M, 1912; 8 pp.) 20c.

19,754—ALASKA—The Rampart and Hot Springs Regions, Alaska. H. M. Eakin. (U. S. Geol. Surv., Bull. 520-I, 1912; 20 pp., illus.)

19,755—ARIZONA—The La Fortuna Mine, Yuma Co., Ariz. F. J. Martin. (Min. and Sci. Press, July 6, 1912; 1 p.) 20c.

19,756—BRITISH COLUMBIA—The Emily Edith Mine, Slocan, B. C. (Can. Min. Journ., June 15, 1912; 1¼ pp.) 20c.

19,757 — CALIFORNIA — Forbestown District, California. Lewis H. Eddy. (Eng. and Min. Journ., July 27, 1912; 3 pp.) 20c.

19,758—CHIHUAHUA—Mining in the Morelos District. G. L. Sheldon. (Min. and Sci. Press, June 29, 1912; 1¾ pp., illus.) 20c.

19,759—CHOSEN—Gold Mining in Chosen. J. D. Hubbard. (Min. and Sci. Press, July 20, 1912; 2 pp., illus.) 20c.

19,760 — CLASSIFIER — The Caldecott Diaphragm Cone Classifier. (Eng. and Min. Journ., Aug. 10, 1912; 1½ pp., illus.) 20c.

19,761—COBALT—Silver Mining at Cobalt, Ontario. Reginald E. Hore. (Min. and Sci. Press, July 20, 1912; 3 pp., illus.) 20c.

19,762—COLOMBIA—El Porvenir Mine in the District of Mallama. F. P. Gamba. (Min. and Sci. Press, July 13, 1912; 1½ pp., illus.) 20c.

19,763 — CONCENTRATES — Treatment of Gold Concentrates. A. H. Martin. (Mines and Methods, July, 1912; 2½ pp.) 20c.

19,764—COSTS—A System of Keeping Underground Costs and Records. G. Hildick Smith. (Journ. Chem. Met. and Min. Soc. of South Africa, June, 1912; 1 p.) Discussion on paper previously indexed. 60c.

19,765—CRUSHING—Pebbles for Tube-Milling. A. W. Allen. (Min. Mag., July, 1912; 1½ pp.) 60c.

19,766—DRY CONCENTRATION of Placer Gold. F. J. H. Merrill. (Min. and Sci. Press, July 13, 1912; 2½ pp., illus.) 20c.

19,767 — HYDRAULIC MINING in Beauce County, Quebec. (Can. Min. Journ., Aug. 1, 1912; 1½ pp., illus.) 20c.

19,768—IDAHO—Gold and Silver in Idaho. J. B. Umpleby, F. C. Calkins and E. L. Jones, Jr. (U. S. Geol. Surv., Bull. 530-G, 1912; 24 pp., illus.)

19,769—MILL—Buffalo Mine and Mill, Cobalt. W. J. Dobbins and H. G. S. Anderson. (Eng. and Min. Journ., Aug. 3, 1912; 5¼ pp., illus.) 20c.

19,770—MILL—Veta Colorada Mill and Cyanidation Plant. Bernard MacDonald. (Min. and Sci. Press, July 6 and 13, 1911; 7½ pp., illus.) 40c.

19,771—MILL—West End Consolidated Mill, Tonopah. J. P. Hart and H. L. Williams. (Eng. and Min. Journ., July 27, 1912; 4 pp., illus.) 20c.

19,772—MILLING—Canvas Tables of the Combination Mill at Goldfield, Nev. (Eng. and Min. Journ., Aug. 3, 1912; 1½ pp., illus.) 20c.

19,773—MILLING—Nevada Consolidated Canvas Tables. (Eng. and Min. Journ., Aug. 17, 1912; 1½ pp., illus.) 20c.

19,774— NEVADA — Mineral Hill, Nevada. R. H. Toll. (Min. and Sci. Press, June 29, 1912; 1½ pp., illus.) 20c.

19,775—NEVADA—Notes on the Antelope District, Nevada. F. C. Schrader. (U. S. Geol. Surv., Bull. 530-J, 1912; 15 pp., illus.)

19,776—NEVADA—Report of the Dexter White Caps Mining Company, Manhattan, Nev. (Salt Lake Min. Rev., June 15, 1912; 2½ pp., illus.) 20c.

19,777—ONTARIO—West Shining Tree Gold District. W. R. Hodge. (Eng. and Min. Journ., Aug. 24, 1912; 2 pp, illus.) 20c.

19,778—PLACER MINING—Economic Mining of Low-Grade Gravel, California. A. H. Martin. (Min. and Eng. Wld., July 13, 1912; 1 p.) 20c.

19,779—PLACERS—Gold Placers Between Woodchopper and Fourth of July Creeks, Upper Yukon River, Alaska. L. M. Prindle and J. B. Mertie, Jr. (U. S. Geol. Surv., Bull. 520-G, 1912; 13 pp., illus.)

19,780—RAND—Labor Supply on the Rand. Editorial. (Min. Mag., June, 1912, 2¾ pp.) 40c.

19,781—RAND—The Three Giant Producers on the Rand in 1911—The Crown Mines, East Rand and Randfontein. Rowland Gascoyne. (Min. and Sci. Press, June 15, 1912; 2 pp., illus.) 20c.

19,782—RAND—Two Decades of Mining on the Rand. A. Cooper Key. (Eng. and Min. Journ., Aug. 24, 1912; 1½ pp., illus.) 20c.

19,783—RHODESIA—Mine Tributing in Rhodesia. W. Anderson. (Journ. Chem. Met. and Min. Soc. of South Africa, June, 1912; 4 pp.) 60c.

19,784—RUSSIA—Gold and Platinum Alluvial Deposits in Russia. Leon Perret. (I. M. M., Bull. 94, 1912; 7 pp., illus.) Contributed remarks on paper previously indexed.

19,785—SMELTING PLANT—The Pennsylvania Smelting Co. Plant. S. L. Goodale and H. C. Ray. (Min. and Sci. Press, July 27, 1912; 2½ pp., illus.) 20c.

19,786—UTAH—Report of the Silver King Coalition Mines Co. (Salt Lake Min. Rev., June 30, 1912; 4 pp., illus.) 20c.

19,787—WYOMING—Atlantic City Mining District, Wyo. O. R. Taggart. (Mines and Minerals, July, 1912; 1½ pp., illus.) 20c.

IRON MINING

19,788—LAKE SUPERIOR—New Developments in the Lake Iron Ore District Since the Beginning of the Year. (Iron Tr. Rev., July 18, 1912; 8 pp., illus.) 20c.

19,789—LIMONITE—Eine neue Industrie in der Luneburger Heide. Diancourt. (B. u. H. Rundschau, July 20, 1912; 1 p.) A new industry in the Lunburg Heath; stripping the subsoil and extracting the underlying limonite for shipment to iron works. 40c.

19,790—MICHIGAN—The Iron Ranges of Michigan. P. B. McDonald. (Min. and Sci. Press, June 22, 1912; 1½ pp., illus.) 20c.

19,791—MINETTE MINING—Bedeutung und Entwicklung des Erzbergbaues im Minettegebiet. A Wagener. (Bergbau, June 13, 1912; 3½ pp.) Importance and development of ore mining in the minette fields. 20c.

19,792—ORE TREATMENT—The J. T. Jones Step Process for the Metallization of Low-Grade Iron Ores. A. E. White. (Mich. Technic, May, 1912; 14 pp.)

19,793—ORE-WASHING PLANT of the Wisconsin Steel Co. C. A. Tupper. (Min. and Eng. Wld., July 13, 1912; 4½ pp., illus.) 20c.

19,794—OREGON—The Bearing of the Theories of the Origin of Magnetic Iron-Ores on Their Possible Extent. Frank L. Nason. (Bull. A. I. M. E., July, 1912; 14 pp.) 20c.

19,795—STOCKPILE TRESTLE—A Permanent Steel Stockpile Trestle for Ore. Erected at the Negaunee Mine of the Cleveland-Cliffs Iron Co. (Iron Tr. Rev., July 11, 1912; 1½ pp., illus.) 20c.

IRON AND STEEL METALLURGY

19,796 — BLAST FURNACE — Eastern Steel Co.'s Thin-Lined Blast Furnace. (Iron Tr. Rev., July 25, 1912; 1 p., illus.) 20c.

19,797—CAST IRON—New Processes for Chilling and Hardening Cast Iron. Thomas D. West. (Journ. A. S. M. E., Aug., 1912; 12 pp.) Discussion on paper previously indexed.

19,798—COKE-OVEN GAS—Ueber die Verwendung von Koksofengas im Martinofen. Simmersbach. (B. u. H. Rundschau, July 5, 1912; 10 pp., illus.) On the utilization of coke-oven gas in the Siemens-Martin furnace. 40c.

19,799—CORROSION—Das Rosten des Gusseisens. Arndt. (Chem.-Ztg., June 18, 1912; 1 p.) On the rusting of cast iron. 20c.

19,800 — CORROSION — The Relative Corrosion of Iron and Steel Pipe as Found in Service. William H. Walker. (Journ. Ind. and Eng. Chem., July, 1912; 1½ pp.) 60c.

19,801—ELECTRIC FURNACES—Beitrag zum Entwicklungstand neuzeitlicher Elektroofen. Kunze. (Stahl u. Eisen, July 4, 11 and 18, 1912; 18¼ pp., illus.) Contributions to the state of development of the latest electric furnaces. $1.

19,802—ELECTRIC PIG IRON—A Microscopic Study of California Electric Furnace Pig Iron. D. A. Lyon and F. C. Langenberg. (Met. and Chem. Eng., Aug., 1912; 1¾ pp., illus.) 40c.

19,803 — ELECTRIC SMELTING — The Production of Pig Iron in the Electric Furnace. (Elec. Rev., London, July 12, 1912; 1¼ pp., illus.) 40c.

19,804 — FOUNDRIES — Electricity in Foundries. (Elec. Rev., June 8, 1912; 6½ pp., illus.) 20c.

19,805—FOUNDRY—Das Eisengiessereiwesen in den letzten zehn Jahren. E. Leber. (Stahl u. Eisen, July 25, 1912; 5¾ pp., illus.) Continuation of article previously indexed. 40c.

19,806—FOUNDRY—Die Neuanlage der Giesserei Rodinghausen in Menden i. W. E. Vorbach. (Stahl u. Eisen, June 27, 1912; 8¼ pp., illus.) 40c.

19,807 — FOUNDRY — Molding Sand Tests. (Am. Foundrymen's Assn., 1912; 12 pp.)

19,808 — FOUNDRY — Molding-Sand Tests. Mineral Characteristics of the Molding Sands. D. Dale Condit. (Am. Foundrymen's Assn., 1912; 34 pp.)

19,809 — FOUNDRY — Molding Sand Tests. The Microscope as a Testing Medium for Molding Sand. H. C. Loudenbeck. (Am. Foundrymen's Assn., 1912; 31 pp., illus.)

19,810—FRANCE—Die Eisen- und Metallhutten-industrie Frankreichs im Jahre 1910. (Gluckauf, July 13, 1912; 3 pp.) The iron and metallurgical industries of France in 1910. 40c.

19,811—GASES—Die Bewegung der Gase in den huttentechnischen Oefen. Roitsheim. (Stahl. u. Eisen, June 13 and July 4, 1912; 11½ pp., illus.) The movement of gases in metallurgical furnaces. 60c.

19,812 — METALLOGRAPHY — Die Bildung des Osmondits in hypo-eutektoiden Stahlen. J. Calian. (Metallurgie, June 22, 1912; 4 pp., illus.) The formation of osmondite in hypo-eutectoid steels. 40c.

19,813—PLANT—New Works of the Stonehouse Works Company, England. (Iron and Coal Tr. Rev., May 31, 1912; 1 p., illus.) 40c.

19,814—PLANT—Progress on Steel Corporation's Duluth Plant. (Iron Tr. Rev., June 20, 1912; 3¼ pp., illus.) 20c.

19,815 — PLANTS — Die Werksanlagen des Stahlwerks Becker in Willich. (Stahl. u. Eisen, June 20 and July 4, 1912; 13¾ pp., illus.) The various plants of the Becker steel works at Willich, Rhenish, Prussia. 60c.

19,816—POWER MACHINERY of the Steel Industry. Robert L. Streeter. (Eng. Mag., Aug., 1912; 18 pp., illus.) First article of series, dealing especially with compressors and hoisting engines. 40c.

19,817—STEAM TURBINE—A New Low Pressure Turbine Installation. (Iron Tr. Rev., July 25, 1912; 1¾ pp., illus.) Details of the mixed-flow steam turbines of the Rateau-Smort type, installed at the South Works of the Illinois Steel Co. 20c.

LEAD AND ZINC

19,818—LEAD ANALYSIS—Methods of Analysis from the Laboratories of Armour Institute of Technology. (Chem. Engr., July, 1912; 2 pp.) Determination of lead in ores. 40c.

19,819—LEAD POISONING—Industrial Lead Poisoning. James O. Clifford. (Min. and Sci. Press, July 6, 1912; 2½ pp.) 20c.

19,820—LEAD SMELTING—The Pennsylvania Smelting Co. Plant. S. L. Goodale and H. C. Ray. (Min. and Sci. Press, July 27, 1912; 2 pp., illus.) 20c.

19,821—RETORT—A Zinc Retort with a Copper Bottom. F. L. Clerc. (Met. and Chem. Eng., Aug., 1912; 4 pp., illus.) 40c.

19,822—SPELTER FROM WASTE—The Manufacture of High Class Spelter from Galvanizers' Waste by the Shortman-Delaville Process. Ernest A. Lewis. (Met. Ind., Aug., 1912; 1¼ pp., illus.) 20c.

OTHER METALS

19,823—ANTIMONY, ARSENIC, ETC.—The Production of Antimony, Arsenic, Bismuth and Selenium in 1911. Frank L. Hess. (Advance Chapter from Mineral Resources of the U. S., 1911; 11 pp.)

19,824—MANGANESE—The Production of Manganese and Manganiferous Ores in 1911. Ernest F. Burchard. (Advance Chapter from Mineral Resources of the U. S., 1911; 20 pp.)

19,825—PLATINUM in British Columbia. (B. C. Min. and Eng. Rec., June, 1912; 6½ pp., illus.) 20c.

19,826—QUICKSILVER in 1911. Production and Resources. H. D. McCaskey. (Advance Chapter from Mineral Resources of the U. S., 1911; 35 pp.)

19,827—THORIUM—A Volumetric Method for the Determination of Thorium in the Presence of Other Rare Earths. The Analysis of Monazite Sand. F. J. Metzger and F. W. Zons. (Journ. Ind. and Eng. Chem., July, 1912; 2 pp.) 60c.

19,828—TIN—An Unusual Zonal Arrangement of Tin Ore in a Vein, Bolivia. Gilmour E. Brown. (Min. Journ., June 15, 1912; 1 p., illus.) 40c.

19,829—TIN—Bolivian Tin Mining. Mark R. Lamb. (Eng. and Min. Journ., Aug. 10, 1912; 3 pp., illus.) 20c.

19,830—TIN—The Production of Tin in 1911. Frank L. Hess. (Advance Chapter from Mineral Resources of the U. S., 1911; 12 pp.)

19,831—TITANIUM—Electric Smelting of Titaniferous Ores. Alfred Stansfield. (Can. Min. Journ., July 1, 1912; 1½ pp.) 20c.

19,832—TUNGSTEN—Prospecting for Tungsten. H. C. Morris. (Min. and Sci. Press, June 29, 1912; ¾ p.) 20c.

19,833—VANADIUM DEPOSITS in Colorado, Utah and New Mexico. Frank L. Hess. (U. S. Geol. Surv., Bull. 530, 1912; 25 pp., illus.) Describes the deposits near Placerville, Colo; Green River, Utah; and in the Sierra de los Caballos, N. M.

NONMETALLIC MINERALS

19,834—ASPHALT—The Production of Asphalt, Related Bitumens and Bituminous Rock in 1911. David T. Day. (Advance Chapter from Mineral Resources of the U. S., 1911; 19 pp.)

19,835 — ASPHALTUM — Development and Increase in the Use of Asphaltum. Harry Larkin. (Journ. Assn. Eng. Socs., July, 1912; 6 pp.) 40c.

19,836—CLAY—The Quebec China-Clay Industry. James G. Ross. (Can. Min. Journ., July 1, 1912; 3 pp., illus.) 20c.

19,837—FULLERS' EARTH—An Early Discovery of Fullers' Earth in Arkansas. J. C. Branner. (Bull. A. I. M. E., July, 1912; 3 pp.) 40c.

19,838—GRAPHITE in Quebec. H. P. H. Brumell. (Can. Min. Journ., July 1, 1912; 2½ pp., illus.) 20c.

19,839—GYPSUM Along the West Flank of the San Rafael Swell, Utah. Charles T. Lupton. (U. S. Geol. Surv., Bull. 530-N, 1912; 13 pp., illus.)

19,840—GYPSUM MINES of England. (Eng. and Min. Journ., Aug. 17, 1912; 1½ pp.) 20c.

19,841—MAGNESITE—Magnesian Cement in India. C. H. B. Burlton. (Journ. of the Royal Society of Arts, July 26, 1912; 13½ pp.)

19,842—MARBLE—Cave Marble (Cave Onyx) in Tennessee. C. H. Gordon. (Resources of Tenn., Aug., 1912; 11 pp., illus.)

19,843—MARBLE INDUSTRY in Quebec. (Can. Min. Journ., July 1, 1912; 1½ pp., illus.) 20c.

19,844—NITRATE OF SODA—L'Industrie du Nitrate de Soude au Chili. Belisario Diaz-Ossa. (Bull. Soc. Industrielle du Nord de la France, June, 1912; 14 pp., illus.)

19,845—PHOSPHATE—A Modern Phosphate Plant. P. Jumeau. (Am. Fertilizer, July 13, 1912; 1½ pp., illus.) A description of the phosphate deposits and plant of the Compagnie Generale des Phosphates de la Floride. 20c.

19,846—PHOSPHATE DEPOSITS of the United States. Wm. H. Waggaman. (Am. Fertilizer, July 27, 1912; 3 pp.) 20c.

19,847—PHOSPHATE ROCK—The Accurate Volumetric Determination of Phosphoric Acid in Phosphate Rock. (Journ. Ind. and Eng. Chem., July, 1912; 2 pp., illus.) 60c.

19,848—POTASH—Alunite. A New Source of Potash. Guy Elliott Mitchell. (Cassier's Mag., July, 1912; 6 pp., illus.) 40c.

19,849—POTASH—Production and Shipments of Potash Salts in Germany. (Am. Fertilizer, June 29, 1912; ¾ p.)

19,850—POTASH—The German Potash Industry. Formation of the Syndicate. Increase in the Number of Producing Mines. Conclusions Regarding the Potash Law. (Am. Fertilizer, July 13, 1912: 1¾ pp.) 20c.

19,851—POTASH—The Search for Potash in Western United States. Gordon Surr. (Min. and Eng. Wld., July 20, 1912; 1 p.) 20c.

19,852—SULPHUR DEPOSITS of Sunlight Basin, Wyo. D. F. Hewett. (U. S. Geol. Surv., Bull. 530-0, 1912; 14 pp., illus.)

PETROLEUM AND NATURAL GAS

19,853—CALIFORNIA—Growth of the Petroleum Industry in California. William H. Storms. (Min. and Eng. Wld., June 22, 1912; 2¾ pp., illus.) 20c.

19,854 — HUNGARY — Natural Gas in Hungary and the Gas Well at Kis Sarmas. A. Strobl. (Journ. Soc. Hungarian Engrs. and Architects of America, July, 1912; 6 pp., illus.) 40c.

19,855—NATURAL GAS; Its Properties, Its Domestic Use, and Its Measurement by Meters. P. F. Walker. (Bull. Univ. of Kansas, Vol. XIII, No. 16, July 1, 1912; 38 pp., illus.) A report published by the Public Utilities Commission of Kansas.

19,856—PERU—La Industria del Petroleo en el Peru. Juan Velasquez Jimenez. (Anales de la Sociedad Cientifica Argentina, Mar., 1912; 46 pp., illus.)

ECONOMIC GEOLOGY—GENERAL

19,857—ANGLE MEASUREMENT—Eine praktische Ausrustung fur die Winkelmessungen bei der geologischen Feldarbeit. Hirschl. (Zeit. f. prakt. Geol., July, 1912; 1 p., illus.) A practical equipment for the measurement of angles in geological field work.

19,858—BRITISH COLUMBIA—Rainy Hollow, B. C. and Southwestern Yukon. E. Jacobs. (Can. Min. Journ., July 15, 1912; 5¼ pp.,illus.) 20c.

19,859—ECUADOR—Sketch of the Geology of Ecuador. W. A. Wolf. (Min. and Sci. Press, July 27, 1912; 2 pp., illus.) 20c.

19,860 — ITALY — Die Erzlagerstatten von Traversella in Piemont, Italien. Muller. (Zeit. f. prakt. Geol., June, 1912; 31 pp., illus.) The ore deposits of Traversella in Piedmont, Italy. 40c.

19,861—NEW ZEALAND—The Geology of the Dun Mountain Subdivision, Nelson. James Mackintosh Bell, Edward de Courcy Clarke and Patrick Marshall. (New Zealand Dept. of Mines, Geol. Surv. Branch, Bull. 12, 1911; 80 pp., illus.)

19,862—ORIGIN OF ROCKS—The Value of Certain Criteria for the Determination of the Origin of Foliated Crystalline Rocks. II. J. D. Trueman. (Journ. Geol., May-June, 1912; 16 pp.) 60c.

19,863—PENNSYLVANIA—The Geology of South Mountain at the Junction of Berks, Lebanon, and Lancaster Counties, Penn. H. N. Eaton. (Journ. Geol., May-June, 1912; 13 pp., illus.) 60c.

19,864—SERVIA—Die Kupfererz- und Limonit-Lagerstatten von Majdan-Pek in Servien. Wendeborn. (Zeit. f. prakt. Geol., July, 1912; 14 pp., illus.) The copper ore and limonite deposits of Majdan Pek, Servia. 40c.

19,865—SOUTH DAKOTA—Contribution to the Study of the Pre-Cambrian Rocks of the Harney Peak District of South Dakota. Gordon S. Duncan. (Bull. A. I. M. E., July, 1912; 12 pp., illus.) 40c.

MINING—GENERAL

19,866—ACCIDENTS—Die todlichen Verungluckungen beim Bergwerksbetrieb in Oberbergamtsbezirk Dortmund im Jahre 1911. (Gluckauf, June 22, 1912; 2¾ pp.) Fatal accidents in mining in the Dortmund district. 40c.

19,867 — ACCIDENTS in Transvaal Mines, with Special Reference to Falls. James Chilton. (Journ. Chem. Met. and Min. Soc. of South Africa, June, 1912; 4½ pp.) Author's reply to discussion. 60c.

19,868—ALABAMA—Statistics of the Mineral Production of Alabama for 1910. Charles Arthur Abele. (Geol. Survey of Ala., Bull. 12, 1912; 51 pp.)

19,869 — ARGENTINA — Mining Prospects of Argentina, South America. R. W. Ellis. (Min. and Eng. Wld., July 27, 1912; ¾ p.) 20c.

19,870—BAILING TANK—Self-Discharging Bailing Tank. M. G. Sohnlein. (Eng. and Min. Journ., July 20, 1912; ¾ p., illus.) 20c.

19,871—BLAST—Methods of Making a 350,000-Cu.Yd. Blast at Piedra, Cal. (Engineering and Contracting, July 24, 1912; 1 p., illus.) 20c.

19,872—BOLIVIA—The Mines of Bolivia. C. F. Z. Caracristi. (Mex. Min. Journ., Aug., 1912; 2¾ pp., illus.) 20c.

19,873—CAGES—Mine Cages at the Desloge Consolidated. C. T. Rice. (Eng. and Min. Journ. Aug. 24, 1912; 1 p., illus.) 20c.

19,874—CAVING SYSTEM of Mining in America. J. Bowie Wilson. (Eng. and Min. Journ., Aug. 10, 1912; 1¾ pp.) 20c.

19,875—CHANGE HOUSE at Franklin Furnace, N. J. (Eng. and Min. Journ., Aug. 24, 1912; 2 pp., illus.) 20c.

19,876—CHURN DRILLING in Shaft Sinking. Tom McCormac. (Min. and Sci. Press, July 13, 1912; ¾ p.) 20c.

19,877—CONCRETE COLLARS for Mine Shafts. (Eng. and Min. Journ., Aug. 10, 1912; 1¼ pp., illus.) 20c.

19,878 — DUST — New Apparatus for Sampling Air for Dust. E. J. Laschinger. (Journ. Chem., Met. and Min. Soc. of South Africa, May, 1912; 4¼ pp., illus.) 60c.

19,879—DUST—Note on Dust Determination by Filtration Through Sugar. A. McArthur Johnston. (Journ. Chem., Met. and Min. Soc. of South Africa, May, 1912; 2 pp., illus.) 60c.

19,880—EXCAVATION—A Method of Keeping Cost of Earthwork so as to Show the Daily Unit Cost for Each Gang. (Engineering and Contracting, July 24, 1912; 1 p., illus.) 40c.

19,881—EXPLOSIVES—The Effect of Stemming on the Efficiency of Explosives. Walter O. Snelling and Clarence Hall. (U. S. Bureau of Mines, Tech. Paper 17, 1912; 20 pp., illus.)

19,882—FIRE PROTECTION—A Gravity Water System. John W. Powell. (Coal Age, June 22, 1912; ¼ p.) 20c.

19,883 — FRANCE — Die franzosische Bergwerksindustrie im Jahre 1910. (Gluckauf, July 20, 1912; 5½ pp.) The French mining industry in 1910. 40c.

19,884—GAS IGNITION—Ignition of Gas by Minature Electric Lamps With Tungsten Filaments. H. H. Clark. (U. S. Bureau of Mines, Tech. Paper 23, 1912; 5 pp.)

19,885—HAULAGE—Determination of Generator Capacity for Mine Haulage. E. B. Wagner. (Coal Age, June 22, 1912; 1 p., illus.) 20c.

19,886—HOISTING—Mine Hoisting Systems Compared. R. R. Seeber. (Eng. and Min. Journ., Aug. 3, 1912; ¾ p.) Remarks on a previous article by B. V. Nordberg. 20c.

19,887—HOISTING on Inclines. Arthur O. Gates. (Eng. and Min. Journ., Aug. 17, 1912; 1 p., illus.) 20c.

19,888—HOISTING ROPES—Die Sicherheit der Forderseile. Speer. (Gluckauf, July 20 and 27, 1912; 43½ pp., illus.) Continuation of article previously indexed. 60c.

19,889—INSPECTION at Beaver Consolidated Mine. (Eng. and Min. Journ., Aug. 17, 1912; 1¼ pp., illus.) 20c.

19,890 — MANAGEMENT — Efficiency Underground. S. H. Brockunier. (Eng. and Min. Journ., Aug. 17, 1912; 1¼ pp.) 20c.

19,891—MANAGEMENT—The Science of Management in Practice—VI. Frederic A. Parkhurst. (Industrial Eng., July, 1912; 4¾ pp., illus.) 40c.

19,892—MINE EXAMINATION—Geology Applied to Mine Examination. Ira B. Joralemon. (Eng. and Min. Journ., Aug. 10, 1912; 2¼ pp.)

19,893—MINING METHOD—Mining by Timbering and Filling at the Homestake Mine. Albert L. Toenges. (Mines and Minerals, Aug., 1912; 2¾ pp., illus.) 20c.

19,894—NEW JERSEY—The Mineral Industry of New Jersey for 1911. Henry B. Kummel. (Geol. Surv. of N. J., Bull. 7, 1912; 37 pp., illus.)

19,895—ORE DOCK—Method and Cost of Constructing a Concrete and Steel Ore Dock for the Duluth & Iron Range R.R. Leland Clapper. (Engineering and Contracting, July 17, 1912; 3½ pp,. illus.) 20c.

19,896—ORE DOCKS—Construction of Permanent Ore-Loading Docks—I and II. C. A. Tupper. (Min. and Eng. Wld., Aug. 3 and 10, 1912; 6¾ pp., illus.) 40c.

19,897—PANAMA CANAL—Le Canal de Panama. A. Dumas. (Genie Civil, May 25, June 1 and 8, 1912; 31 pp., illus.) To be continued. $1.

19,898—PHILIPPINE ISLANDS—Mineral Resources of the Philippine Islands. R. Arthur. (Min. and Eng. Wld., July 20, 1912; 2 pp., illus.) 20c.

19,899—PRODUCTION—Silver, Copper, Lead and Zinc in the Central States in 1911. Mine Production. B. S. Butler and J. P. Dunlop. (Advance Chapter from Mineral Resources of the U. S., 1911; 82 pp.)

19,900—QUEBEC—A Brief Historical Sketch of Gold and Copper Mining in Quebec. (Can. Min. Journ., July 1, 1912; 1 p.) 20c.

19,901—SAFETY in Mine Operation. Alexander M. Gow. (Mex. Min. Journ., July, 1912; 2¼ pp., illus.) Methods of Oliver Iron Mining Co. 20c.

19,902 — SHAFT SINKING — Sinking Cable. (AEG Journ., June, 1912; 7 pp., illus.) 40c.

19,903—SHAFT SINKING—Trolleys for Sinking Incline Shafts. (Eng. and Min. Journ., Aug. 24, 1912; 1 p., illus.) 20c.

19,904—SHAFTS—Two Concrete-Lined Mine Shafts at Annabelle, W. Va. F. C. Auld. (Coal Age, July 13, 1912; 2¼ pp., illus.) 20c.

19,905—SOUTH DAKOTA—Water Power Possibilities of the Black Hills, W. R. Putnam. (Pahasapa Quart., June, 1912; 5¼ pp., illus.)

19,906—STOPING—Advantages of a Level Stope. H. Y. Russel. (Eng. and Min. Journ., Aug. 10, 1912; 1 p.) 20c.

19,907—TIMBERING—Notes on Stope Timbering. (South African Min. Journ., June 15, 1912; 1 p., illus.) 40c.

19,908—TRANSVAAL — The Benguella Railway. A. Shortened Route to the Transvaal. J. Hartley Knight. (Eng. Mag., July, 1912; 7 pp., illus.) 40c.

19,909 — TUNNEL — Determination of Probable Rock Temperature in a Continental Divide Tunnel. E. Lauchli. (Eng. Rec., June 8, 1912; 2¾ pp., illus.) 20c.

19,910—TUNNEL—Lining Part of the Bonticou Grade Tunnel on the Catskill Aqueduct. John H. C. Gregg. (Eng. Rec., June 22, 1912; 2¾ pp., illus.) 20c.

19,911—TUNNEL—Methods of Constructing the Rondout Pressure Tunnel of the Catskill Aqueduct. (Eng. and Contracting, May 22, 1912; 4½ pp., illus.) 20c.

19,912—TUNNELING—Rapid Mine Tunneling in Arizona. Norman Carmichael. (Eng. and Min. Journ., Aug. 17, 1912; 3¾ pp., illus.) 20c.

19,913—TUNNELS—Method and Cost of Constructing Six Small Tunnels in Earth and Rock, Chicago Water Works. Myron B. Reynolds. (Engineering and Contracting, July 3, 1912; ¾ p., illus.) 20c.

19,914—VALUATION of Base-Metal Mines. W. H. Goodchild. (Min. Mag., July, 1912; 2½ pp.) 60c.

19,915—VENTILATION—Versuche uber die Zweckmassigkeit blasender oder saugen der Luttenbewetterung bei Rettungsarbeiten. (Preus. Zeit. f. B., H. u. S., 1912, Part 2; 3¾ pp., illus.) Experiments on the usefulness of ventilation either by blowing fresh air or exhausting foul air through pipes in rescue work.

19,916—WAGES—Bonus System on Los Angeles Aqueduct. (Mines and Minerals, June, 1912; 2½ pp., illus.) Rules of operation and method of computing bonus footage and earnings. 20c.

19,917—WOOD PRESERVATION—Die neuesten Fortschritte auf dem Gebiete der Holzkonservierung. (Bergbau, June 27, 1912; ¾ p.) The latest progress in the preservation of wood. 20c.

19,918—WORKMEN'S ACCIDENT COMPENSATION. A. Dinsmoor. (Coal Age, June 29, 1912; 1½ pp.) 20c.

ORE DRESSING—GENERAL

19,919 — CONCENTRATOR — The Peck Centrifugal Concentrator. (Eng. and Min. Journ., Aug. 3, 1912; 1 p., illus.) 20c.

19,920 — CRUSHING — Amerikanische Mahlmaschinen. Nagel. (Chem.-Ztg., June 18, 1912; 2 pp., illus.) American grinding machines. 20c.

19,921—JIG—Harz Jig Improvements. (Eng. and Min. Journ., Aug. 24, 1912; 1½ pp., illus.) 20c.

19,922—ORE DRYING—Abrasion and Dust Losses in Ore Drying. Carl F. Dietz and Dyke V. Keedy. (Bull. A. I. M. E., July, 1912; 22 pp., illus.)

19,923—SLIMES CONCENTRATION—Multiple-Deck Concentration of Slimes. Charles J. Downey. (Min. Sci., July 25, 1912; 3 pp., illus.) Describes new invention of A. R. Wilfley. 20c.

METALLURGY—GENERAL

19,924—ALLOYS—Ueber Blei-Zinn-Antimon-Legierungen. William Campbell. (Metallurgie, July 8, 1912; 3½ pp., illus.) On lead-tin-antimony alloys. 40c.

19,925—FLOW OF GAS FORMULAE with Reference to Illuminating Gas. J. M. Spitzglass. (Progressive Age, June 1, 1912; 8½ pp., illus.) 40c.

19,926 — GAS — Gasfeuerungen und Kraftgasanlagen mit chemischer Regenerierung von Vergrennungsgasen. Gwosdz. (Gluckauf, June 1, 1912; 4½ pp., illus.) Gas firing and power gas plants with regeneration of combustion gases. 40c.

19,927—MELTING BY GAS—Industrial Uses for Gas. Edward F. Davis. (Progressive Age, June 15, 1912; 1½ pp.) Brief notes on the uses of gas for melting, annealing, hardening and tempering metals. 20c.

19,928—PROPERTIES OF METALS—Ueber die Aenderung der Eigenschaften bei der bearbeitung von Metallen. Tanemann. (Zeit. f. Electrochem., July 15, 1912; 14½ pp., illus.) On the change of properties in working metals. Also discussion. 40c.

19,929—ROASTING—Thermische Daten zu den Rostprozessen. K. Freidrich. (Metallurgie, July 8, 1912; 9 pp., illus.) 40c.

19,930 — SMELTER FUME — Electrical Fume Precipitation. F. G. Cottrell. (Bull. A. I. M. E., July, 1912; 14 pp., illus.) 40c.

MINING AND METALLURGICAL

19,931—AERIAL ROPEWAY at the Blaydon Burn Pits of the Priestman Collieries, Limited. (Iron and Coal Tr. Rev., June 28, 1912; 1 p., illus.) 40c.

19,932—CAGE—A Drop Bottom Cage Used at the Mines of the St. Louis Smelting & Refining Co. (Eng. and Min. Journ., Aug. 3, 1912; 1 p., illus.) 20c.

19,933 — DIESEL MOTOR — Teer und Teerol als Treibmittel fur den Diselmotor. Rath. (Gluckauf, June 22, 1912; 9 pp.) Tar and tar oil as motive power for the Diesel motor. 40c.

19,934—DIESEL MOTOR—Untersuchung eines mit Teerol betriebenen 480 P S-Dieselmotors. Butow and Dobbelstein. (Gluckauf, June 22, 1912; 7¼ pp., illus.) Testing of a 480-hp. Diesel motor actuated by tar oil. 40c.

19,935—ELECTRIC FURNACE for the Treatment of Tin Dross, Concentrates from Cyanide Mills and Other Metallurgical Work. R. S. Wile. (Met. and Chem. Eng., Aug., 1912; 2½ pp., illus.) 40c.

19,936—ELECTRIC FURNACE—Thirty Years' Progress in the Electric Furnace. F. A. J. Fitzgerald. (Proc. A. I. E. E., June, 1912; 9 pp.)

19,937—ELECTRIC MINING APPLICATIONS. E. A. Lof. (School of Mines Quart., July, 1912; 23 pp., illus.) 60c.

19,938 — ELECTRICAL INSTALLATIONS of the Lena Gold Mining Co. (Min. Journ., June 29, 1912; 1¾ pp., illus.) 40c.

19,939—ELECTRICAL PLANT of the "El Guindo" Mining Company, La Carolina. Spain. (AEG Journ., June and July, 1912; 6½ pp., illus.) 60c.

19,940—ELECTRICITY — Electric Mine Operations—Rotary Converters. Stuart Rice. (Min. and Eng. Wld., June 29, 1912; 1½ pp.) 20c.

19,941—ELECTRICITY in the El Guindo Lead Mine in Spain. (Elec. Rev., London, July 26, 1912; 2¾ pp., illus.) 40c.

19,942—ELECTRICITY—The Factor of Safety in Mine Electrical Installations. H. H. Clark. (U. S. Bureau of Mines, Tech. Paper 19, 1912; 14 pp.)

19,943—FLOW OF WATER—Calculating the Flow of Water in Pipes. T. W. Holloway. (Power, June 4, 1912; 3½ pp., illus.) 20c.

19,944—FURNACES—Industrial Furnaces. J. B. M. Knutsen. (Aust. Min. Stand., May 30, and June 13, 1912; 2¾ pp., illus.) Deals with gas, oil-fuel and electric furnaces. 80c.

19,945—GAS ENGINE—The Design and Construction of a New Gas Engine Built by the C. & G. Cooper Co. (Iron Tr. Rev., July 11, 1912; 3 pp., illus.) 20c.

19,946 — GAS ENGINES — The Direct Driving of Mining Plant by Internal-Combustion Engines, with Special Reference to the Operation of Colliery Fans. A. Vennell Coster. (Cassier's Mag., July, 1912; 11 pp., illus.) 40c.

19,947—GAS PRODUCER—Status of the Gas Producer and of the Internal-Combustion Engine in the Utilization of Fuels. Robert Heywood Fernald. (Bureau of Mines, Tech. Paper 9, 1912; 42 pp., illus.)

19,948 — GAS PRODUCER — Verdampfungsversuch an einem mit Wefer-Gasfeuerungen ausgerusteten Zweiflammrohrkessel. Butow u. Dobbelstein. (Gluckauf, May 18, 1912; 3¼ pp., illus.) Experiment of generating steam in a two-tube boiler equipped with Wefer gas producer. 40c.

19,949—GASOLINE INDUSTRIAL LOCOMOTIVES. Frank C. Perkins. (Mines and Minerals July, 1912; 1¼ pp., illus.) Difficult conditions to which the internal combustion motor has been adapted. 20c.

19,950—HOISTING—Sicherheitsvorrichtung Grunewald mit Regel-, Stau- und abgestufter Bremswirkung. Forster. (B. u. H. Rundschau, June 5, 1912; 2 pp., illus.) The Grunewald safety brake and regulator on hoisting engines. 40c.

19,951—HOISTING—Tests on an Electric Winding Plant with Flywheel Storage, and Comparison of Balancing with that Obtained by Buffer Batteries. L. Crouch. (Eng. Rev., June 15, 1912; 2¼ pp., illus.) 40c.

19,952—HYDRO-ELECTRIC PLANT—A New Large Hydro-Electric Plant for the State of Oaxaca. (Mex. Min. Journ., June, 1912; 1 p.) 20c.

19,953—LAMP—A New Electric Miners' Lamp. D. B. Rushmore. (Bull. A. I. M. E., July, 1912; 8 pp., illus.) 40c.

19,954—LAMPS—Die Dirchblasesicherheit von Doppelkorblampen. Beyling and Hatzfeld. (Gluckauf, June 1, 1912; 8¾ pp., illus.) The security of double basket lamps against blowing through. 40c.

19,955—MINE TELEPHONE of Today. E. L. Cole. (Coal Age, July 27, 1912; 3½ pp., illus.) 20c.

19,956 — MOTOR TRANSPORTATION for the Contractor. Rollin W. Hutchinson. (Concrete-Cement Age, July, 1912; 3½ pp,. illus.) 20c.

19,957 — ORE BUCKETS — Joplin Ore Buckets. (Eng. and Min. Journ., Aug. 10, 1912; 1½ pp., illus.) 20c.

19,958—PUMP—The Hydraulic Ram—Its Possibilities of Development and Use. Stirling B. Hill. (Can. Engr., May 23, 1912; 5 pp., illus.) 20c.

19,959 — SHOPS — Oliver Iron Mining Co.'s Shops at Hibbing, Minn. (Iron Tr. Rev., July 11, 1912; 6½ pp., illus.) 20c.

19,960—STEAM TURBINE—Untersuchung einer Abdampfturbine auf Zeche ver. Helene u. Amalie. (Gluckauf, July 6, 1912; 1½ pp.) Testing an exhaust steam turbine at United Helene & Amalie colliery. 40c.

19,961—TURBO BLOWERS—Construction and Operation of Turbo-Blowers and Compressors. Franz zur Nedden. (Eng. Mag., July and Aug., 1912; 17½ pp., illus.) 80c.

19,962—VENTILATION—Untersuchung eines doppelt saugenden Grubenventilators, Bauart Hohenzollern, auf der Zeche Graf Bismarck. (Gluckauf, July 20, 1912; 1¼ pp., illus.) Testing a double suction mine ventilator of the Hohenzollern type at Graf Bismarck colliery, Westphalia. 40c.

INDUSTRIAL CHEMISTRY

19,963 — GAS MANUFACTURE—By-Products in Gas Manufacture. Charles E. Munroe. (Journ. Franklin Inst., July, 1912; 34 pp., illus.) 60c.

19,964—LITHOPONE—La Fabrication du Lithopone. E. Lemaire. (Genie Civil, June 1, 1912; 1½ pp., illus.) 40c.

19,965—PRODUCER GAS—Zur Teerbestimmung im Gereratorgase. Gwiggner. (Chem. Ztg., Apr. 25, 1912; 1½ pp., illus.) Concerning the determination of tar in producer gas. 40c.

19,966—SULPHURIC ACID—Its Manufacture and Its Development up to the Present Time. Wm. Wilke. (Am. Fertilizer, July 13, 1912; 2 pp.) 20c.

19,967 — WATER PURIFICATION — Speisewasserreinigung und Permutitverfahren. Basch. (Chem.-Ztg., July 6, 1912; 2 pp.) Purifying feed water and the permutite method.

19,968—WATER PURIFICATION—Ueber Wasserreinigung und Kesselsteinbekampfung. Braungard. (Chem. Ztg. May 9, 1912; 2 pp.) 40c.

PERSONALS

Mining and metallurgical engineers are invited to keep The Engineering and Mining Journal informed of their movements and appointments.

J. R. Finlay has returned to New York.

Prof. J. F. Kemp has returned from Panama.

F. F. Sharpless is in Joplin, Mo., on business.

James A. Kelly, has opened offices at 740 Henry Building, Seattle, Wash.

B. B. Thayer has returned to New York from his summer sojourn in Montana.

F. K. Simonds, of Simonds & Burns, New York, is in Cuba on professional business.

John Seward, of New York, is at Cobalt, Ont., making an examination of the Kerr Lake mine.

Dyke V. Keedy, of Dietz & Keedy, Boston, is now in Kentucky on professional business.

Leon Pepperburg, of San Francisco, visited Mina, Nev., recently on professional business.

J. M. Callow, consulting engineer for the Inspiration Copper Co., is now in Salt Lake City, Utah.

R. J. Grant, of Denver, Colo., recently inspected mining properties in Ophir and Telluride Colorado.

John P. Cosgro, resident manager at Mexico City, of the Mine & Smelter Supply Co., is in Paris.

W. C. Brace, mining engineer of Denver, Colo., recently inspected mines in the Telluride district, Colorado.

D. E. Young, general manager Blue Lead mine, near Bangor, Butte Co. Calif., has returned to the mine from Boston.

Frank A. Leach, of California, has been nominated by the President for the position of superintendent of the San Francisco mint.

Forest Rutherford has been appointed superintendent of reduction works for the Copper Queen Consolidated Mining Co., at Douglas, Arizona.

Alfred Still has recently been appointed chief electrical engineer to the mining department of the Algoma Steel Co. His headquarters will be at Magpie Mine, Ontario.

J. M. Rodd, of Kent, England, late metallurgist for Elliott Brothers, an electrical engineering firm of London, is now studying zinc and lead mining in southwestern Missouri.

W. Frank Roberts, who has been assistant superintendent of the Bethlehem Steel Co., South Bethlehem, Penn., has been made superintendent of the Lehigh works of that company.

Edward Soppit, recently with the Jamison Coal & Coke Co., has been appointed general superintendent of the Latrobe Connellsville Coal & Coke Co., and has taken charge of operations.

William Brown, Hibbing, Minn., was elected president of the Iron Mountain Co., Duluth, Minn., at the annual meeting recently. The company is developing property on the Cuyuna range.

Samuel Hale has resigned as vice-president and general manager of the Wisconsin Steel Co., Chicago, to become general manager of the Algoma Steel Corporation, Sault Ste. Marie, Canada.

A. P. Cameron, superintendent of the Penn Gas Coal Co., has been made superintendent of the Westmoreland Coal Co., succeeding E. G. Smith, who becomes consulting engineer of both companies.

Paul Klopstock, general manager for the Gold Note Mining and Milling Co., Kennedy, Nev., has gone to Syracuse, Sicily. Mr. Klopstock is consulting engineer of the Ragusa asphalt mines at that place.

Charles Vickers, editor of the non-ferrous casting department of the *Foundry*, has resigned to take charge of the introduction of copper-titanium for the Titanium Alloy Manufacturing Co., Niagara Falls.

Captain Thomas Nichols, who has been employed for 12 years by Pickands, Mather & Co., Cleveland, on the Mesabi range, will have general supervision of a new property which will be developed by the Cascade Mining Co., on the Marquette range.

Herbert C. Hoover left New York last week for California, where he will remain for about a month enjoying a vacation, after which he will return to New York. His translation of "Agricola" is now in press, and probably will be issued in about three months.

T. Poole Maynard, formerly assistant state geologist of Georgia, announces that he has opened an office as mining and consulting geologist at Chattanooga, Tenn. Examination and reports will be made on both undeveloped and developed mineral properties, including ore deposits.

James A. MacKillican, who has been city engineer of Escanaba, Mich., for two years, has accepted the position of assistant superintendent of the Merden Iron Co., Hibbing, Minn., and will assume his duties on Sept. 1. He is a graduate of the Michigan School of Mines, at Houghton.

I. S. Roe, formerly superintendent at the Barrows mine of the Virginia Mining Co., on the Cuyuna range, has been transferred to Crystal Falls, Mich., where he will take charge of the Carpenter, Monongahela and Ravenna mines. The properties are all controlled by M. A. Hanna & Co., Cleveland.

Viscount T. Inouye, professor of mining in the Imperial University at Tokio, and Yoichi Katsura, director in the Fujita company, which owns the Kosaka mine, in Japan, are visiting in the United States to observe mining and metallurgical practice. Professor Inouye expects to return to New York in about a month and Mr. Katsura in about three months.

Among the visitors to the International Congress of Applied Chemistry, are Professor Hoffman of the Clausthal School of Mines; Professor Stavenhagen of the Berlin School of Mines; Professor Simmersbach of the Technische Hochschule at Breslau; R. Franke, manager of the works of the Mansfelder Kupfer Schieferbauende Gesellschaft; and Dr. F. Heberlein of the Metallurgische Gesellschaft, Frankfurt am Main, Germany.

OBITUARY

Thomas Means died about Aug. 1 at Bakersfield, Calif. He was 69 years old. Mr. Means came to California in early days, and was the first explorer of oil-bearing land in Kern County. Although he had opportunities to gain great wealth, his estate is found to be valued at only about $50,000. Not only was he the first explorer of the field, but it was through his insistance that the Kern River field was so early developed.

D. M. Forker died at Cincinnati, Ohio, Aug. 29, aged 52 years. He was born in Meadville, Penn., but went to Alabama when a young man and engaged in the iron business. He aided in starting the Gate City rolling mill, near Birmingham, and became one of the larger owners. When the Gate City mill was sold to the Republic Iron & Steel Co., he joined the working force of that company, and had since remained with it.

Societies and Technical Schools

American Chemical Society—This society was to give a general reception to the members of the Eighth International Congress of Applied Chemistry on Saturday evening, Sept. 7, at the Metropolitan Museum of Art, New York.

American Iron & Steel Institute—The general committee of the American Iron and Steel Institute has selected Friday and Saturday, Oct. 25 and 26, as the dates for the fall meeting of the institute, which will be held at Pittsburgh. The committee is composed of President James A. Farrell, of the Steel Corporation, President E. A. S. Clarke, of the Lackawanna Steel Co., President C. M. Schwab, of the Bethlehem Steel Co., President John A. Topping, of the Republic Iron & Steel Co. and Frank S. Witherbee, of Witherbee, Sherman & Co. The program is now in course of preparation and will be announced soon.

Editorial Correspondence

From our Representatives at Important Mining Centers

San Francisco

Aug. 27—The state mining bureau *Bull.* No. 63, "Petroleum Development of Southern California," by Paul W. Prutzman, has been completed in the manuscript and a portion of it is in type; the remainder is being edited by the state mineralogist, W. H. Storms. It will be ready for distribution within a few weeks, and will contain a large number of analyses of the oils found south of Tehachapi. This bulletin will be sold at a price that will cover only the cost of printing and binding. The bulletin was begun during the regime of Mr. Storms' predecessor, but was not completed because of lack of funds. The last bulletin on petroleum issued by the bureau was published in 1904. Great progress has been made in the industry in that period, and there have been urgent demands for further publications on the subject. The mining bureau is also about to issue *Bull.* No. 64, containing statistical data of the production of all minerals in California in 1911. The date of the issue will be about three months earlier than former statistical bulletins, and the data will be accurate and properly compiled. It will contain also a brief history of the bureau, and the statutory laws governing mining in the state. The chapter on laws has been carefully revised from former similar bulletins. There are frequent inquiries for concise and direct publications of the mining laws, and this bulletin will meet the demand. It will be distributed gratuitously.

There are 31 survey parties at work under the direction of the California state highway commission; 18 are on the coast route of the proposed new highway between San Diego in the extreme southwestern part of the state and Willets, in the north. Willets is at the end of the Northwest Pacific R.R., which is being extended to Eureka, the most northerly port of call in the state and the entrepot for a large timber industry and for an undeveloped mining district that contains both copper and gold ores. The 13 other survey parties are working in the counties along the western side of the state, in the region embracing the principal mining districts. The western route of the proposed new highway will not enter directly all the mining counties, but most of them may be directly connected by laterals. Since the completion of the automobile tour, inaugurated by the Inyo County good roads association and conducted by W. G. Scott, of Bishop, a mining engineer, the mining counties not directly on the route of the highway are taking greater interest in the project. Inyo County is practically isolated as regards transportation, but it has been one of the most active in support of the highway. So far, all the counties through which the highway is routed have agreed to furnish rights-of-way and to build all necessary bridges that exceed 20-ft. span. The people of Sierra County are circulating a petition for a $100,000 bond issue, to be expended exclusively in road building, having concluded to depend upon themselves instead of the state for the construction of roads, particularly in the northern part of the county. While the state commission may not aid Sierra County in its plans, the construction of the roads will give the outlets that are essential to the full development of the mining districts that are now reached either by trail or poor roads. It is not possible that the routing of the highways will please all the pople and include direct roads through all the 58 counties of the state, but it is possible that every mining county will be either directly or indirectly benefited if they will assist the undertaking, although the prime purpose of the $18,000,000 appropriation was not so much intended for the development of mining districts as to provide easy going for automobiles.

Denver

Aug. 29—Colorado is gradually recovering from the effects of the conservation fever. President Taft has just restored to entry as agricultural land 751,691 acres included in coal withdrawals in this state, and this makes a total return to the public domain of upwards of 2,000,000 acres. On the report four years ago that the whole of North Park was underlaid with coal 563,099 acres was withdrawn. Now the Geological Survey has discovered that the coal in the center of the park is 2000 ft. deep and therefore unworkable. This acreage has been restored to entry. Along the east and west sides of the park, however, there is an outcrop of lignite ranging from 40 to 60 ft. in thickness and this is still reserved. The 188,592 acres withdrawn in Montezuma County have not been found to be coal bearing and have also been restored to entry as agricultural land.

It is now stated on good authority that the Burlington and Santa Fé railroads have asked for bids from the Pueblo plant of the Colorado Fuel & Iron Co. on 75,000 tons of steel rails and fastenings, to be used in Colorado, Wyoming and adjacent territory. These two orders will approximate $2,500,000. Bids for 75,000 tons more have been asked for by the Harriman and other lines.

The government attorneys claim a great victory because Federal Judge R. E. Lewis has forced the Colorado Fuel & Iron Co. to go to trial to answer charges of having acquired 5000 acres of coal land by agricultural filings, nothing being said in the applications of the "dummy" entrymen about the coal-bearing qualities of the land. In doing this, Judge Lewis has gone over two decisions of the U. S. Land Office, at Pueblo, which held that the land was agricultural. Some of the land adjoins the Primero mine, the best producer of the Colorado Fuel & Iron Company.

For the first six months of 1912, the output of the new Yampa coal field, in Routt County, on the Denver, Northwestern & Pacific Ry., was 246,375 tons, as compared with 103,496 tons for the same period in 1911. The total coal output of Colorado for the first six months of the year was 5,277,238 tons.

Butte

Aug. 28—A party of Eastern men and others connected with the United Missouri River Power Co., arrived at Helena, Aug. 23, on a trip of inspection to the various properties. The party consisted of Max Hebgen, manager of the Montana Irrigation & Reservoir Co.; C. F. Kelley, vice-president of the Anaconda Copper Mining Co.; George F. Canfield, secretary of the Butte Electric & Power Co.; C. W. Whitmore, president of the North American Co.; Frederick Strauss, manager for J. & W. Seligman & Co.; and J. C. Carson, of New York. They proceeded to the Hauser Lake dam and viewed the reclamation project in the valley below, leaving afterward for Great Falls to make an inspection of the power plants there. The itinerary of their trip also includes stops at Lewiston, Livingston, Billings and the Montana Reservoir & Irrigation Co.'s power plant, on the Madison River. As a result of the visit of these men, who have been instrumental in harnessing a portion of Montana's water power, it is believed that one more link will be added in the resumption of work on the Holter dam, near Wolf Creek, which has been about one-third completed.

As a result of the efforts made by Representative Pray, in the interests of the

Butte chamber of commerce, to secure an appropriation from the government with which to investigate underground water conditions, looking to the reclamation of the arid flat south of Butte, the assurance has been forwarded that steps are about to be taken in that direction. Professor Mizner, of the Geological Survey, who has charge of underground water investigations for the government, will arrive in Butte, Oct. 1, and will spend several weeks in determining whether or not the flat is underlain with artesian or other sources of water. There are about 10,000 acres of land in the valley which could be reclaimed from its present practically useless condition, by the discovery of water in sufficient quantity.

Salt Lake City

Aug. 31—The mineral output of Utah and Nevada during 1911 is given in detail by Victor C. Heikes, of the U. S. Geological Survey. He shows that the total output of Utah in gold, silver, copper, lead and zinc amounted to $36,837,457. The production is given by counties, Salt Lake County coming first with a total of $22,561,615, followed by Juab, Summit, Tooele and Utah Counties in the order named. The gold produced was valued at $4,696,998, of which $5634 was produced from placers. The silver output amounted to 12,473,787 oz., copper to 146,960,827 lb., lead 136,496,750 lb., and zinc to 17,840,261 pounds.

A bill permitting agricultural entry on oil land in Utah has passed the House. The object of the measure is to permit the agricultural development of large tracts of land in southern Utah classified as valuable for oil, and withdrawn from entry.

Mining-machinery houses report good sales and much heavy machinery has been shipped from Salt Lake during the summer. Seven compressors were sent out by two firms in a single week.

Tintic shipments have lately been increasing. The output for the week ended Aug. 30 amounted to 231 cars. This is one of the largest week's shipments for the camp, the previous record having been made in March with a total of 205 cars. For the second week in August the output was about equal to that of the record week of March. The shipments include zinc ores from several properties. It was understood that the new rates on zinc ores had gone into immediate effect without the 30 days advertising usually required. Word has just been received, however, that the new rate has been held up again. The new rate was to have gone into effect Aug. 20, being $7.30 per ton to the Kansas smelters, as compared to $9.20 per ton formerly. Zinc ores so far shipped have been sampled at the Silver City plant of the Utah Ore Sampling Co., and settlements are made here before the ore reaches the Kansas smelting belt.

Kingman, Ariz.

Aug. 27—There is evidence of renewed interest in Mohave County in the use of auto trucks for freighting. This is probably primarily due to the continued rise in the price of hay and grain and the resultant increase in the cost of freighting with teams, although it is also evident that the manufacturers of auto trucks are commencing to give more attention to the design and construction of trucks intended for service under conditions similar to those existing here. In the last few years several different makes of trucks have been tried out in the county, the results in the majority of cases not being satisfactory and indicating that, until a closer study of the actual working conditions is made by the designers and builders of these trucks and their plans are altered to meet the requirements of a service different from that of the paved streets of a city, their products will not come into general use in such districts. Several years ago, two 10-ton trucks of special design were built in Chicago and shipped to Kingman at a probable cost of about $10,000 each. They are each fitted with a 90-hp. gasoline engine, the power from which is converted into electrical energy by a generator and then applied to the propulsion of the machines by two motors on each truck. The gage proved to be too wide for the single-track roads of the county. Their cumbersomeness and complexity of construction were so prejudicial to their chances of successful operation that they were never even given a thorough working test and still stand in Kingman as a monument to the lack of foresight upon the part of their designer.

Among the different trucks which have been in use in the county are the White, the Knox, the Grabowsky, the Buick, the Avery and lately the Saurer. A White 1500-lb. truck has been in service between Kingman and the Big Sandy for about one year, making two round trips of 120 miles each week. With the exception of the Saurer, this truck has probably given more satisfactory service than any of those mentioned. In the recent month's trial of the Saurer truck by the Arizona Southwestern Copper Co. the cost was about $4.50 per ton for a haul of 22 miles, a portion of the road being through heavy sand and the greater part of it up-grade, the total rise in elevation being probably over 2000 ft. It is understood that the Gold Road Mines Co. has ordered two auto trucks for operation between Kingman and Gold Road, and it is also understood that the Lovin & Withers Co. is considering the purchase of one or two for use between the same places. As the latter company does most of the freighting by teams in the county, its interest in auto-truck transportation is significant.

Negaunee, Mich.

Aug. 29—A new mining company has started operations in the territory between the Gogebic Rand and the Iron River district. The corporation is known as the Presque Isle Iron Co. and includes Messrs. Whitesides, W. H. Cole, and associates, of Duluth. Some drilling has been done, and shaft sinking will be started soon. This area between Gogebic Range and the Iron River district is receiving attention from several large interests, including Frederick Carpenter, of Chicago, a landowner in the district, and the E. J. Longyear Co., of Minneapolis, which is examining the country geologically.

Since the news of the big find at the Mastodon property in the Crystal Falls district has circulated around, other interests have begun taking options in the vicinity, and it is likely that considerable drilling will be done in tracing the ore formation in the region south and west of the Dunn mine.

The Oliver Iron Mining Co. is drilling between the Dunn and Mastodon mines, on two "forties" of the Michigan Iron & Land Co. over the extensive holdings of which the Oliver company has a blanket option. The orebodies in the Crystal Falls district are extremely difficult to trace, owing to the thick overburden and the irregularity of the occurrence of the lenses of ore in the slates. For these reasons exploration work in the district is costly, but it is in such districts that most of the recent finds were made, as the costly and difficult explorations were overlooked until late years.

Jena, Germany

Aug. 20—During the last week most of the technical journals have devoted much space to the history of the Krupp firm and descriptions of the festivities celebrated in commemoration of the 100th anniversity of its foundation. *Stahl und Eisen* published a special pictorial jubilee number. The festivities lasted from Aug. 3 to 8, when they were suddenly interrupted by the fatal explosion at the Lothringen colliery, in which 111 men were killed and about 20 men were injured. The Krupps had no interest in this colliery, but out of respect to the Emperor, who hastened to the scene of disaster, all further amusements were called off.

The German daily papers are hooting at Herr von Havenstein, president of the Reichsbank, for his notes of warning to the financiers of industrial enterprises, and are decrying Herr von Gwinner, president of the Deutsche Bank, as a false prophet for predicting an impending collapse of the present industrial boom. The boom still continues, but undoubtedly there is a feeling of nervousness in financial circles.

The Mining News

The Current History of Mining

Alaska

W. B. Close of the White Pass & Yukon R.R. has announced plans for building a smeltery at Skagway or White Horse, and an extension of the White Pass road from White Horse 120 miles down the Yukon River to the Tantalus coal mine.

Gold Bullion—The initial cleanup of this property amounted to about $26,000. William Barthoff, of Knik, is superintendent.

Tacoma—This claim on Slate Creek has been purchased by John Miller, of Seattle, who will install a hydraulic plant.

Alaska-Treadwell—During July the mill was in operation 31 days, crushing 81,116 tons of ore, from which 1650 tons of concentrate was produced. The estimate of free gold recovered from this ore was $118,216; gold in concentrate $102,186, a total of $220,402. The realizable value was $218,198, the operating expense $78,349; construction expense $13,967, leaving an estimated net profit of $125,882. The yield per ton of ore milled was $2.71.

Arizona

Mohave County

C. P. Lupher recently made a promising strike in a tunnel near the head of McGeary Wash in the Hualapai mountains. The ore contains gold, silver and lead.

Wallapai Precious Metals Co.—It is reported that this company will commence development work on its group of five claims in the Wallapai district at Stockton Hill. George W. Gibson, of Denver, manager.

De la Fontaine—Forty tons of zinc ore has been sorted by M. A. Burke and associates and is ready for shipment to the smelter. An equal tonnage of lead ore is about ready for shipment.

Ruth—Sinking has been temporarily discontinued at a depth of about 425 ft. Crosscutting has been started at the 400-ft. level. Last year a mill was built upon the property by the Young Construction Co., but owing to litigation between the construction company and the operators of the property, it is not in operation.

Kingman Copper Mining & Milling Co.—This company, capitalized at $100,000, has been organized by H. E. Bierce, of Denver, and associates, and under the active direction of Thomas McNeely, is developing the McNeely copper properties at Mineral Park.

Nevada-Arizona Gold Mines Co.—The Lovin & Withers Co. has hauled three carloads of machinery from Antares to the property of this company in the Music mountains. It is reported that the framework is erected and that the mill will soon be ready for operation.

George Washington—A carload of ore is ready for shipment to the smelter from this mine at Mineral Park.

Santa Cruz County

Bradford—Messrs. Lindsey, McFarland and Gardner have shipped five cars of ore from this mine to the Copper Queen smeltery. The ore contains copper and a little silver. The mine belongs to the Ferry estate.

Glove—The Sheehey brothers, owners of this promising zinc and lead mine, are negotiating with John Hoy and J. E. Higgins, who are field men for Senator Clark, for the sale of this and some other prospects.

Silver Crown—This group has been optioned by Josiah and M. A. Bond to St. Louis lead men. There are several veins in the group carrying a mixed copper-lead-silver ore, silver predominating.

Tia Juana—Six claims, belonging to W. E. Balcom, James Kane and the estate of the late Professor Blake, have been examined for Senator Clark.

California

Amador County

Plymouth Consolidated—The Pacific shaft has been unwatered to the 1800-ft. level. The skip cable broke recently 300 ft. from the skip, dropping the skip to the bottom of the shaft. No one was injured. Details of the accident are not available.

South Jackson Mining Co.—The new vertical shaft is down 200 ft. The ground is favorable for fast sinking.

Butte County

Installations of machinery for treating black sand, in order to recover fine gold and platinum are being considered for the Nimshew, Mineral Slide and Bader mines near Magalia.

Forbestown Consolidated Gold Mines—M. J. Cooney, of Oroville, president of the company, has inaugurated the leasing system for the operation of the Gold Bank and Golden Queen mines in the Forbestown district. There are 20 men now employed in development and construction work. A 20-stamp mill will be built from the machinery of the old Gold Bank and the Miller mill. The Miller mill is still in good repair, and has 20 stamps, but the distance to the mine prevents its economical use in the position in which it stands. The new structure will occupy the site formerly occupied by the Gold Bank. Frank Naughton, of Forbestown, superintendent.

Eldorado County

Zentgraf—A new stamp mill has been installed at this mine, near the Big Buzzard. The property will hereafter be known as the Home. It is being developed by Sacramento men.

Standard Unit—It is reported that the mill, idle for two years, will resume crushing. S. Beer, inventor of the Beer roller mill, owner and superintendent.

Big Jeff—A 5-stamp mill and concentrator is being installed at this mine, at China Hill, near El Dorado.

Inyo County

Santa Rosc—A 6-drill compressor has been purchased, to be driven by gasoline until electric power is available. The company has built and is improving 12 miles of new road between the mine and Keeler, a distance of 25 miles. The railroad could be built, shortening the distance to 10 miles, and a five-mile aërial tram would answer the purpose of carrying the ore to a point five miles below Keeler. A 5-ton Pierce-Arrow motor truck has been ordered for freighting and ore carrying. It is the purpose of the company to equip the mine for development to a depth of 500 to 800 ft. Mr. Meisell, superintendent.

Nevada County

William J. Barrett, while panning for gold in the South Yuba River, near Jones bar, found a small diamond which weighed a little less than ¾ carat, and valued at about $15. There is no positive evidence that it is a product of the formation; it may have been dropped there.

Cheyenne—This property in the Willow Valley district has been leased by Peter Tautphaus, of San Francisco, to Kistle Brothers, of Nevada City.

Arctic—Work has been resumed at this mine, north of Washington. A large

auto truck is being operated between Emmigrant Gap and the mine, hauling machinery. Air drills are a part of the equipment to be installed. J. V. Kline, superintendent.

PLACER COUNTY

Zeibright—The 10-stamp mill is running steadily. The tunnel, which is now 1100 ft. long, is being advanced along the vein and some stoping is being done. J. H. Patrick, of Emmigrant Gap, lessee and superintendent.

SIERRA COUNTY

Kirkpatrick—A new compressor, to be driven by a 20-hp. Fairbanks-Morse gasoline engine, is being installed. This will facilitate the work of driving the tunnel which is now in 300 ft. The company is prospecting for gravel. J. H. Ragon, of Goodgrass Bar, superintendent.

Alaska—The work of rebuilding the mill and headframe, which were destroyed by fire last November, is nearly completed and the new 40-stamp mill will soon be in commission. Eight Wilfley concentrators have been installed. George St. John, of Pike City, superintendent.

TRINITY COUNTY

Trinity Dredging Co.—The new dredge to work ground six miles up Trinity River from Lewistown is expected to be in operation early in September.

Gold Trail Mining Co.—This is a new corporation organized in Glenn County to operate an old mine in Trinity County, which was a former producer. H. B. Turman, of Willows, and Lewis Osburn, of Reno, Nev., are interested.

TULARE COUNTY

About 30 claims were recently registered in one day in the Powell district, about 14 miles east of the terminus of the Porterville-Northwestern R.R., at Springville. Gold, silver and lead are reported to have been found.

TUOLUMNE COUNTY

About 500 ft. of the wall for a dam across Tuolumne River, two miles below Jacksonville, has been completed. The dam is to divert the stream so that the bed of the river may be mined for gold; 16 men are employed in two shifts; another shift will be added.

Atlas—Electric power has been installed and two shafts are being sunk on this mine at Tuttletown. J. L. Witney, superintendent.

Street—A contract has been let for unwatering this mine at Tuttletown.

Newbaumer—The 5-stamp mill is running steadily on good ore from this mine at Tuttletown.

Rose Springs Mining Co.—New machinery has been ordered for the Iron Spring mines, near Tuolumne. S. O. Trescott, manager.

Colorado

CLEAR CREEK COUNTY

Clara—This mine, in the Alice district, is being operated with a small force of men. A good vein of milling ore is being developed. Small streaks of ore in the vein assay as high as 40 oz. gold, and it is estimated that a small tonnage of smelting ore may be sorted out to advantage. A campaign of systematic development is planned. Doctor Woodring, president and manager.

Argo Reduction & Ore Purchasing Co.—This company is building a mill near the portal of the Argo tunnel. The company will sample and purchase ores from properties operating through the tunnel. The sampler and mill building are to be of steel, the contract for which has been let to the Minneapolis Steel & Machinery Co. The sampler will have a capacity of 350 tons per 10 hr. The first section of the mill will have a capacity of 100 tons per day. More units will be added later. The process of treatment follows closely that used in the Hudson mill, and will consist of amalgamation, concentration, and cyanidation, using stamps, Card tables, and continuous agitation and decantation in the cyanide department.

LAKE COUNTY—LEADVILLE

The ore shipments from Leadville for July were smaller than for the preceding month, being retarded by heavy rains and surface water. The total was 57,500 tons.

La Plata—Zinc-carbonate ore has been discovered in several of the old stopes of this mine on Rock Hill, and as the old shaft has been retimbered and the drifts cleaned out, the lessees are enabled to break ore and expect to hoist about 30 tons daily.

Dome—About 1000 tons per month of zinc-carbonate ore are being shipped by the lessees of this mine on Rock Hill.

Highland Chief—A 27-hp. hoist is being installed on the Eliza shaft of this mine on Breece Hill, which is under lease to W. E. Hollister. Drifts will be run from the bottom level to open the ore developed in the Black Prince and St. Louis.

Onyx—In this claim which is above timber line on French mountain, the owner, John Rahrer, is sacking rich gold ore. The first shipment will be made in a few days.

SAN JUAN DISTRICT

Great interest is being taken, in this district, in the treatment of zinc-bearing ores. The zinc plant at the Sunnyside mill is in constant operation and four Huff electrostatic machines are running.

Frisco Tunnel Co.—This company, operating the Bagley tunnel, near Animas Forks, is completing the construction of a mill. The installation of machinery will include Blake, and Sampson crushers, two Akron chilean mills, Callow cones, spitzkasten and Wilfley tables. The mill was framed at Silverton during the early months of this year, and construction was commenced just as soon as the Silverton Northern R.R. was open to Animas Forks. The construction work is being done by Paul Hansen and M. E. Porter; they feel confident that the work will be completed in October.

Gold King—High-grade, free-milling gold ore, associated with pyrite-bearing quartz, is being produced from this mine. A strike of such ore was recently made by Charles Airy, a lessee.

Southern Exploration & Mining Co.—A strike of copper ore was recently made in the Congress mine. The mineral is enargite, and is found in a shoot that in all probability extends up to the old Walsh workings, because the discovery was made 90 ft. below the place where Thomas Walsh took out a rich pocket of this ore. F. B. Goudy is manager for the company.

Intersection Development Co.—In Maggie Gulch, this company has increased the capacity of the mill and unwatered the mine.

Esmeralda—Lessees on this mine in Maggie Gulch are mining rich argentite ore from veins of fairly stable character.

Emma—Negotiations with Boston men have been closed and it is now expected that operations will be started. These will include driving a lower tunnel on the lode and possibly some sinking.

TELLER COUNTY—CRIPPLE CREEK

Gold Dollar—Most of the lessees on this Beacon Hill mine operate from the main shaft. The Husted shaft is operated by the Union Leasing Co. The August production was large.

Mary McKinney—The profits made from ore opened below the old water-level are said to be large. The output for August was 40 carloads of higher grade than usual.

Cresson—A rich strike of sylvanite is said to have been made at the 1200 level. Richard Roelofs, manager.

Six Points—For the last month the output from Chilson & Polly's lease, which is being operated through the Los Angeles shaft, was four carloads of mill ore from the 475-ft. level.

Vindicator—It is officially stated that the development at the 1500 level has proved the oreshoots as big and as rich as in the levels above. In a crosscut to the south a new vein has been opened showing ore which has not been found in the upper workings.

Isabella—Another strike has been made in the Fackerell lease on the north 900-ft. level of the Lee shaft.

Idaho

Boise County

It is reported that Moore's creek below Idaho City is to be worked again. The placers are known to be rich, but on account of large boulders have heretofore proved to be unprofitable. A system of cables operated by electric power will be used.

Boston & Idaho—The two dredges of this company continue to operate at a profit. The larger, 15-cu.ft. boat, has completed its work on Elk creek and is starting down Moore's creek on its first cut, to make connection with the smaller dredge, which is working up that creek.

Banner—About 14 men are at work on this property opening the main tunnel and prospecting.

National Mining & Development Co.—A 5-stamp mill has been built recently on the Mountain Chief mine, near Quartzburg. A. C. Gallupe, manager.

Golden Age—The mill at this property has been closed pending further development work.

Gold Hill—The 20-stamp mill continues in steady operation. Considerable prospecting and development work is being done on the 500-ft. level.

Idaho County

Hydraulic-mining operations are being conducted on the property formerly owned by S. A. Moon, near the falls of Meadow creek, a little below the old town of Florence.

Gilt Edge—Work is to be resumed on these quartz claims owned by Daniel Dunn. Much mining equipment is being hauled to the property.

Mineral Zone—The hoist has been put in place on this mine and sinking has been resumed. The road has been graded from the mine to the mill and ore bins of 300 tons capacity have been erected. For a time, but five stamps will be put into commission, but later, as soon as enough ore can be hauled in, the mill will be operated at full capacity.

Michigan

Copper

Franklin—Shaft No. 3 is down to the 17 level. At No. 1 shaft the drift from the 23 level is being extended to the line of No. 1 shaft. When this point is reached a raise will be started. Upon the completion of this work there will be two shafts available for hoisting and the production will be materially increased. Conditions underground in the lower level of No. 1 shaft are highly satisfactory.

Isle Royale—This company is shipping about 2250 tons of ore per day to the mill from shafts Nos. 2, 4, 5 and 6. Shaft No. 5 is maintaining the best results. Production is to be gradually increased as fast as the necessary labor can be secured.

Keweenaw Copper Co.—At a recent directors' meeting a consolidation plan was worked out which will be submitted to the stockholders. The company has acquired about 6000 acres of additional land and the proposed merger takes in the Arnold, Ashbed and Meadow properties, so that the company will have about 13½ miles on the Ashbed lode. W. J. Uren, formerly general superintendent of the Tamarack-Osceola properties, was the engineer employed to report on the properties and it is probable that he will be placed in charge of the development work.

Iron

Hilltop—The Oliver Iron Mining Co. has surrendered its lease on this property on the Menominee Range after proving some ore by exploration; the reason given is because so much attention must be given to the Hill lands on the Mesabi. C. T. Roberts is one of the fee owners and the tract will now revert to the Roberts Ore Company.

Lucky Star—At this Breitung mine in Negaunee the shaft is now in solid rock, the 85 ft. of surface having been successfully gone through. The rock at this place is diorite, which is generally looked upon as favorable ground for a permanent shaft. Small one-man plugger drills are being used in sinking, and one of a new type, which rotates its own steel, is giving satisfaction; it is understood that this type has been used for several years in Europe.

Wickwire Mining Co.—Power for the Cortland mine of this company, situated west of the Hiawatha, is now obtained entirely from electricity. The air compressor is operated by electricity and forces compressed air into a receiver from which it is taken for hoisting. It is planned to equip the Wickwire mine in the same manner and close down the present steam plant.

Jones Furnace Co.—At the Kloman mine at Republic, where the Jones furnace has been used in experimenting in the metallization of low-grade iron ores, unsatisfactory results are reported and the work on iron ores will be discontinued, at least temporarily. It is proposed to try out some copper ores in the furnace and a consignment of Mexican ore is soon to be put through.

Empire—This Cascade Range mine of Oglebay, Norton & Co. is being operated only in a small way, contrary to expectations early in the season.

Salisbury—This mine is closed for two weeks while an electric hoist, compressor and centrifugal pump are being installed. Power will be furnished from the company's water-power plant at Marquette. The electric hoist will be run by alternating current direct from the power house at 2300 volts. The centrifugal pump will replace the big Cornish pump. It is understood that the centrifugal pump was purchased some time ago, as the later installations of the company, notably at the Negaunee mine, have been electric plunger pumps.

Minnesota

Mesabi Range

Because of the possibility of an advance being made in the ore rate, shippers have been anxious to get as much ore out of the local port as possible before the first of the month. Within the last two weeks a record was made of 230,000 tons of ore shipped in 36 hours.

Oliver Iron Mining Co.—It is reported from Duluth that this company has called for bids for stripping a new property near Mesaba station on the Duluth & Iron Range R.R. The bids are to be opened Sept. 1. This is one of the properties that is to be developed at once in what is known as the new Mesabi district. Compared with properties like the Fayal and St. Louis, the operation, it is understood, is not a large one.

Pillsbury, Bennett & Longyear—Five drills are in operation on this property, east of Keewatin, to ascertain at what depth the ore lies and to determine whether it will be operated by stripping or milling. This property has been drilled, and the work now being done is a final drilling preparatory to making the mine a shipper.

Bray—At this mine grading for 10 company-houses has been started. A shaft will be sunk this autumn and work will be continued all winter. Nels Johnson, superintendent.

Montana

Butte District

North Butte—Since the discoveries of rich ore, principally zinc, in the northern portion of the district, this company has been exploring the northern part of its territory with gratifying results. The company recently acquired interest in the Carlisle and Protection claims, east of the Elm Orlu mine, and it is understood that the north crosscut driven some time ago from the Speculator shaft on the 1800-ft. level, will be continued on into the newly obtained ground with the expectation of finding zinc ore. Some of the richest ore produced is now being shipped from the Snowball vein. The Berlin vein, north of the Snowball, was explored by a shaft sunk to the 1000-ft. level several years ago, but only recently has any systematic exploration work been done at greater depth than that, and the results are very promising.

Ophir—Machinery for the new mill is being erected. It is believed that the mill

will be completed and in operation this autumn.

Butte-Minnesota—This company has been incorporated for $750,000 in shares of $1 par value. Directors and incorporators are: William Vuoti, John E. Porthan, Emil Bjorkman, John Kukko, Jacob Lampi and Emanuel Antio, of Ely, Minn.; Peter Johnson, of Chisholm, Minn., and Emil Jung and Isaac Peterson, of Butte.

Cascade County

The old mining camp of Neihart, one time a silver producer, may be resuscitated. The camp was practically deserted in the early '90's. With uptodate processes of treating zinc ores, the Neihart ore, rich in zinc, may be treated profitably in the future.

Fergus County

Barnes-King—This company, which has been seeking new mining property, has acquired the claims of the North Moccasin Mining Co., at Kendall. The property comprises four claims, the Santiago, the Santiago Fraction, Sceptor and Possible. The Barnes-King company discovered ore in the adjoining Santiago just at the end line of its own property. It worked out the small part of this ore within its own ground. The North Moccasin company mined the ore to some extent, and was making large profits when a cave-in closed the mine, which, from lack of funds, has not since been opened.

Spotted Horse—Development work is being carried on steadily at this mine, near Maiden, and lately some good ore has been opened. St. Paul men, owners of the property, have been recently making an inspection of the mine to decide upon the advisability of erecting a mill. The mine has been a steady producer of rich ore for many years.

Gallatin County

West Gallatin—Preparations have been nearly completed for the beginning of placer mining on a large scale, and within a week it is expected that 1000 cu.yd. of gravel will be sluiced daily. The company owns placer ground in the West Gallatin cañon, near the Michener camp, and recently completed a 4½-mile ditch to the property, which conveys a large volume of water under a strong head, to be used in sluicing. Thomas Michener, chief owner of the property, is managing operations.

Jefferson County

Mount Washington—George W. Wilson, of Butte, and John D. Pope, manager of the North Butte Mining Co., have obtained a two-year option on a group of seven claims in the Colorado district, and are preparing to install a hoist and surface buildings preparatory to active operations there. The property, which is owned by Frederick Kauf, lies between the Alta on the east, and the Bluebird and Pen Yan on the west. The Mount Washington company, capital 100,000 shares, par $5, has been incorporated by Wilson and Pope to defray the expenses of development work.

Lewis & Clark County

Penobscot—M. W. Anderson is developing a portion of this mine, which lies north of the Bald Butte mine, by running a tunnel east on the vein. This mine was formerly a producer of rich ore and was sold by its former owner, Nate Vestal, at a high price.

Nevada

Comstock Lode

Mexican—According to the bullion-tax statement just rendered to the Storey County tax collector, the company, for the quarter ending June 30, 1912, shipped to the mill 6486 tons of ore, the gross yield from which was $131,844. The expenses for operating during that period were $61,000; milling expenses and sale of bullion, $26,007; transportation and freight, $1568. The bullion tax paid for the three months was $1834, being figured on the net yield. The company shipped 12 bars of bullion up to and including Aug. 28. The last week of the month the mill was shut down for three weeks, when the filter was rewound, the first time it has been necessary since the mill started, six months ago.

Ophir—The production for the three months ended June 30, 1912, was 1842 tons of ore, which was milled at the Kinkead mill, giving a gross yield of $46,334.

Consolidated Virginia—Ore milled during the June quarter, secured from the exploration work on the 2400-ft. level, gave gross returns of $7044.

Comstock-Phoenix—During the quarter ended June 30, 587 tons of ore was sold, which gave a net yield of $18,331, from this mine in the Silver Star district.

Crown Point—For the quarter ended June 30, 6995 tons of ore was shipped to the Yellow Jacket mill, which yielded $35,462. This ore was low grade, stoped from the 1200-ft. level.

Lincoln County—Pioche District

Shipments of ore gathered in small quantities by the Pioche Assay Office (Snyder & Empey) are being made at the rate of about one carload per week. The Highland-Mary, in the Highland district, is shipping about one carload per month. A carload of zinc-lead ore, sorted from the old Raymond & Ely dump by lessees, has just been shipped to Kansas. Lessees of the Condor mill tailings dump will soon finish the shipment of about 15,000 tons.

Mendha-Nevada—Shipments are being made from the dump at the rate of 40 tons daily, *via* the Prince Branch R.R. One and one-quarter miles of pipe and a pump will be installed to provide adequate water service, whereupon operations in the mine will be resumed.

Day-Bristol—Operations at the Day mine have been suspended and the force transferred to the Bristol properties. Copper ores from the May Day and Gypsy shafts are being shipped at the rate of about one car daily, by wagon to the Pioche-Pacific R.R. A survey has been made for a telpherage system to eliminate the long wagon haul, the tunnel project having been abandoned.

Prince Consolidated—This company is still shipping tailings from the old Bullionville dump at the rate of about 300 tons daily. A preliminary survey has already been made for a spur to the Dry Valley tailings dump where work will be commenced shortly. The Prince mine is shipping about 200 tons daily of manganese ore. The diamond drill being operated from the 500, which is the water level, recently struck high-grade lead-silver ore at a depth of 340 ft.

Nye County

Shipments in tons from Tonopah mines to date and for the week ended Aug. 22, are as follows:

Mines	Week	Year to Date
Tonopah Mining	3,450	113,819
Tonopah Belmont	3,685	75,851
Montana-Tonopah	1,041	34,933
Tonopah Extension	1,055	33,568
West End	805	24,619
Midway	40	420
MacNamara	455	11,852
North Star	.....	130
Mizpah Extension	.....	40
Jim Butler	300	400
Totals	10,881	295,632
Estimated value	$270,775	.....

Mizpah Extension—The first shipment, of 40 tons of ore from the 1000-ft. level, was made Aug. 10.

Tonopah Merger—Drifting on the vein on the 980-ft. level of the oreshoot is still in progress.

Tonopah Extension—This company has declared a dividend of 2½c. per share payable Oct. 1, this, with a dividend of the same amount, paid July 1, makes the total amount of dividends distributed by the company $350,000. The clean-up of the mill for the first half of the month of August resulted in the shipment of 2690 lb. of bullion worth $30,500. The main ore shoot on the 500-ft. level is now over 300 ft. long. The new vein on this level is being drifted on at the 660-ft. level 700 ft. west of the place where first encountered.

MacNamara—The 10-stamp mill is now treating 67 tons of ore daily.

Tonopah-Belmont—The report for July, 1912, states that a total of 10,415 tons of ore was milled for a net profit of $114,081, this being the smallest profit for many months.

North Star—A new oreshoot has been cut on the 800-ft. level.

Montana-Tonopah—A new shoot of good milling-grade ore has been cut on the 390-ft. level, another on the 565-ft. level and a third has been opened on the 765-ft. level.

Midway—A winze from the 535-ft. level has cut a new ore shoot.

Manhattan-Big Four Co.—Contracts for the erection of a 150-ton mill at this property have been signed. The plans stipulate that the mill be completed and in operation before Jan. 1, 1913. L. K. Koontz is president of the company.

Tonopah Mining Co.—As a result of an inspection by J. E. Spurr, consulting engineer for the company, the directors have decided to prospect its most western claim, the Sand Grass, on which a shaft has been sunk to a depth of 585 ft., but no lateral work has been done.

In addition to the six regular producing mines in the camp there are now 16 other properties being developed on the east and west ore zones.

New Mexico

Grant County

Silver Hill—H. L. Dotson and G. C. Eastman have a lease on this group of mines. The claims were located in 1875 and much work has been done upon them, but the complex ore, which carries zinc, lead, copper, gold and silver, was so difficult to treat that profitable production could not be maintained. The present lessees expect to be able to ship galena to El Paso, Tex., and blende to Bartlesville, Okla., within a few weeks.

Oregon

Green River Copper—Patrick Nestor, of Portland, Ore., and Wick O'Connell, of Duluth, Minn., have made a contract with the stockholders of this mine, in Douglas County, to install new machinery within 60 days, and to commence development work.

Utah

Juab County

An ore buyer from the Kansas Zinc Co. has been in Tintic making contracts for zinc ore.

Lower Mammoth—Prospecting for zinc ore is being done and some has been opened on the 1500- and 1800-ft. levels. Silver-lead ore was discovered recently in the western part of the property. There is also a stringer of silver-lead ore on the 1000-ft. level. These are being followed.

Yankee—Two weeks more work will be necessary to clean up the low-grade dump ore, which is being marketed at the rate of about a car per day.

Swansea Consolidated—Some delay has been caused by an accident to one of the boilers, but ore is again being hoisted at the usual rate.

Chief Consolidated—An increase in shipments has been made during the last few weeks, the output ranging from 25 to 30 cars. For the week ended Aug. 16, 29 cars were shipped. Efforts are being made to have the Denver & Rio Grande R.R. construct a switch, which will make loading possible directly into the cars, eliminating the present wagon haul.

Colorado—Drifting from the 500-ft. level of the Crown Point has been discontinued. This level corresponds approximately to the 1000-ft. level of the Colorado.

Dragon Consolidated—Diamond drilling has been in progress for the last six weeks on the south end of this company's ground. Several hundred feet was drilled. There has been some trouble with the power arrangements, due to the long distance from the compressor. Work has been discontinued for the present.

Daly-Judge—A contract has been given to J. A. McIlwee & Sons, of Denver, tunnel contractors, for driving various drifts and crosscuts in this property. Work on this contract will begin Sept. 1. Other contracts for similar work have been made with the Daly West.

Barry-Coxe—This company shipped 27 tons of ore during the week ended Aug. 17. The roads from Scott Hill have been poor, but are improving. The main tunnel is in 240 ft., and two orebodies have been opened.

Salt Lake County

Bingham-New Haven—It is reported that by the new ore contract with the International Smelting Co., $1.50 a ton will be saved. The ore will be shipped over the Utah Consolidated tramway.

Ohio Copper—The payment of the first half of the $1 per share assessment was extended to Aug. 28.

Michigan-Utah—The tram from Alta down Little Cottonwood is being overhauled, and should be ready to handle ores within the next two weeks.

Columbus Consolidated—Shipments are being made, and the company is having some difficulty in securing ore teams for its output.

Summit County

Park City shipments for the week ended Aug. 24 amounted to 2,926,880 pounds.

Little Bell—Shipments are again being made from this property.

Thompson-Quincy—Between 15 and 20 tons of ore is reported to have been mined from the raise, which recently cut ore in fissures near the limestone-quartzite contact. Drifting on this ore has been started.

Washington

Bear Mountain—Operations at this silver mine near Colville, Stevens County, will be resumed by Thomas Newton in the near future.

Ferry County

Last Chance—This mine is being unwatered by Phillip Creaser, for examination by a syndicate which has an option on it. If conditions are satisfactory, operations will be resumed at once.

McKinley—Operations at this property near Orient are at a standstill, awaiting the arrival of new machinery which has been ordered.

Boston & Maine—Active operations will be started on these claims by A. E. Stewart, of Republic, and extensive developments are planned.

North Washington Power & Reduction—The result of a recent 10-day run of ore at this plant was a gold and silver ingot weighing 196 lb., and of a total value of $10,600. The capacity of this plant will be doubled as soon as the new rolls are installed.

Okanogan County

Molson—New machinery is being installed in this gold mine near Chesaw, and after a general overhauling, steady operations will be started.

Apex—The shaft of this mine is being drained, and after a 1½-year shutdown, this property will again be opened.

Wisconsin

Vinegar Hill Zinc Co.—This company has installed an Overstrom sludge table to save the fine sulphide slime at the Wilkinson mine near Benton. In addition to its zinc output this mine produces 300 to 400 tons of iron pyrite per month.

Reich—Litigation has been settled and mining operations will be commenced by F. W. Meeks, of Galena, Ill., who has purchased the mill equipment.

Beloit-Merger—This company, operating the Beloit-Elmo mine, has completed the installation of a Fairbanks-Morse oil engine and has resumed underground work.

Wyoming

Albany County

Commercial Gold Mining Co.—A crosscut tunnel is being driven on this property to intersect the vein.

Klondyke—A strike of high-grade gold ore was made recently at this property, near the Snowy Range, in Carbon County, about 10 miles from Centennial.

Mary Ellen Mining Co.—At this mine, at Atlantic City, in Fremont County, preparations are being made for underground operations. It is stated that four carloads of mining machinery have recently been received from Denver.

Canada

British Columbia

Richmond Group—The company operating this property in the South Belt, Rossland district, has recently purchased the Lily May and Black Horse mineral claims, those claims being adjacent to the former holdings of the company. On the Lily May there is a shaft 200 ft. deep with some lateral workings on the 100- and 200-ft. levels. On the Black Horse claim there are two shallow prospecting shafts. It is the intention of the company to erect a hoist at the Lily May shaft and start development work from that place.

Granby Consolidated—Negotiations have been concluded for the purchase by this company of the mineral rights to about one acre of the Snowshoe mine, the property of the Snowshoe Gold & Copper Mining Co. The ore will be removed from the mine through the tunnel of the Gold Drop property of the Granby company, which passes through property adjoining that recently required.

Standard Silver-Lead Mining Co.—This company, operating the Standard mine, near Silverton, has declared a dividend of $50,000, making the total dividend paid within the last year $225,000.

Red Cliff—The first shipment from this mine, in the Portland Canal district, consisted of 511 tons of ore, which was shipped to the smeltery at Tacoma. A second shipment of 750 tons was ready to be shipped the last week in August. A. Erskine-Smith, president.

Judge Scott—Filling operations have been started in the new 10-stamp mill on this property, in the Chilliwack district.

Moody—This group of six copper claims, at Tasso Harbor, Moresby Island, in the Queen Charlotte group, has been leased by F. W. Rossburg, of Butte, Mont., and shipments will be made in the near future to the smeltery at Tacoma. The property is owned by Arthur Gowing, of Vancouver, and associates.

British Columbia—Atlin District

Malhuin Syndicate—At this mine on Otter Creek, the season so far has been occupied in installing a large plant to operate the ground prospected last year by a Keystone drill. The work is almost completed, and piping will be commenced shortly. H. Malhuin, manager.

Engineer—This mine on the Taku area has lately been working a large crew of men. It appears to be the intention of the owners of this property to push systematic development and ascertain the extent of ore. Several good shoots of ore have recently been discovered, and progress will be watched with great interest.

Ontario

Moose Head—This copper property, in Cobden Township, seven miles northwest of Blind River, has been taken on option by J. A. Hacker, of Chicago, and associates. Two new shafts will be sunk and if results are satisfactory, a $50,000 plant will be installed.

Ontario—Cobalt

Nipissing—The monitor at work on this property has uncovered a new vein supposed to be an extension of vein No. 128.

King Edward—An endeavor is being made to arrange matters with the shareholders so that this mine may be reopened.

Foster—This property will be reopened on a leasing basis. C. B. Flynn, who is one of the principal owners of the McIntyre, is promoting the leasing company.

Apex—Work is to be resumed on this property, which has been closed for some time.

Standard—The creditors of this company have refused to accept the offer made by the directors. It has been decided that the company should go into voluntary liquidation, and the assets be sold at public auction.

Ontario—Porcupine

McEnaney—Construction work on the new mill has been started.

Rea—Negotiations are under way for the reopening of this property.

North Dome—The main shaft will be sunk to a depth of 200 feet.

Dome—An electric hoist will be installed at the head of the incline to handle the ore from the 45- and 100-ft. levels to the crushers.

Mexico

Jalisco

Mololoa and El Favor—These Makeever mines in the Hostotipaquillo district are under the management of Walter Neal. During July, 298 tons of high-grade ore was shipped to the Aguascalientes smeltery, and 417 tons of manganiferous ore was milled. A 36-ton lot of high-grade ore was shipped from the Mololoa to the Aguascalientes smeltery, in July, and it is expected that shipments can be continued. The necessity of providing air connections has retarded shipments lately. During July, 523 tons of Mololoa ore was treated in the El Favor mill.

Cinco Minas—All arrangements have been made for the erection of a 250-ton reduction plant at this mine in the Hostotipaquillo district. The mill will be built of steel and concrete. The equipment will include 30 stamps, each weighing 1650 lb., and five tube mills for re-grinding. An all-slime cyaniding process will be used. The ore will be delivered from the mines to the mill over an electric surface tramway ½ mile long. Power will be supplied by the Chapala Hydro-Electric & Irrigation Co. J. W. Crowdus is in charge of construction work; Harry E. Crawford is general manager.

Sonora

Greene-Cananea—The concentrates from the Miami mill, in Arizona, are fed direct to the converters, and it is because of this that the company has been enlarging its converter plant so as to be able to produce 6,000,000 lb. of its own copper per month this autumn. Within the last two weeks two of the new converter stands have been put into commission.

La Esquina—A drainage tunnel 700 ft. long is being driven on this property to unwater the vein. As soon as drained the mine will be put upon a producing basis. It is expected that Morton Lindley will examine the property in the near future.

Nacozari Consolidated Copper Co.—At this mine work is being done on the 4000-ft. tunnel to tap the main orebody of the district at greater depth. Unexpected veins are being encountered in driving this tunnel, some of which carry profitable ore. John Alexander, manager.

San Nicolas—This mine, under lease to Frank Borgeson, is producing a fair quantity of ore, some of which is high grade.

Moctezuma Copper Co.—The shaft at the Pilares mine is being sunk to the 2000-ft. level. Labor seems to be plentiful, many men coming in looking for work who have never been in the district before.

Metates—James Nolan and J. Baumann, have been leasing this property near Oputo. They recently denounced some claims of their own in that district and expect to begin work on them in the near future.

Lucky Tiger—During July the mills crushed 6046 tons of ore; the cyanide plant treated 5810 tons of tailings from the two mills and 1829 tons from old dumps in 28 days operations. The bullion, concentrates, and shipping ore produced were estimated to be worth $158,000, the costs at $71,413.

South America

Braden—To facilitate the new milling operations, the management has determined to experiment on finer grinding, and one Hardinge mill and one 22-ft. tube mill have been shipped to the property. When these experiments on grinding have been completed, provided the results by the new method continue satisfactory, it is the intention to equip the entire mill with the Minerals Separation process.

The Market Report

Current Prices of the Metals, Minerals, Coal and Mining Stocks

Coal Trade Review

New York, Sept. 4—The seaboard bituminous trade is still improving. Demand is good and prices are generally firmer. The coastwise trade is showing more activity than at any time this year.

In the West trade is also in good position, with a large demand for steam coal. Consumers are also inclined to put in stocks ahead rather freely.

The anthracite market is behind in deliveries. The anthracite companies have not yet made up the April-June shortage, while consumers and dealers are pressing for supplies. There is some fear of a shortage of cars, as the collieries are now using all the equipment they can get. Storage yards are generally empty and coal is shipped as fast as it can be mined.

Coastwise shipments of coal from leading Atlantic ports half-year ended June 30, long tons:

	Anthracite	Bituminous	Total
New York	6,875,678	5,883,281	12,758,959
Philadelphia	834,983	2,333,510	3,168,493
Baltimore	88,087	1,845,189	1,933,276
Newport News	.....	1,430,104	1,430,104
Norfolk	.....	2,570,077	2,570,077
Total	7,798,748	14,062,161	21,860,909
Total, 1911	9,108,945	13,012,245	22,121,190

Total decrease this year, 260,281 tons, or 1.2%. New York covers all the harbor shipping points, including barge shipments to city and neighboring wharves.

Belgian Coal Trade—Imports and exports of fuel in Belgium, half-year ended June 30, metric tons:

	Imports	Exports	Excess
Coal	3,884,851	2,452,953	Imp. 1,431,898
Coke	454,372	463,406	Exp. 9,034
Briquettes	201,295	338,828	Exp. 137,533
Total	4,540,518	3,255,187	Imp. 1,285,331
Total, 1911	4,215,283	3,349,053	Imp. 866,230

Imports are from Germany, France and Great Britain.

Iron Trade Review

New York, Sept. 4—The iron and steel markets continue strong and active, with little falling off from the standard of the past two months. The only decline in demand seems to be in structural steel, and this is prospective rather than actual. It is due to two causes, the difficulty of arranging deliveries, and the higher rates of interest increasing the cost of financing large new building projects.

New records were made in August tonnage of shipments of steel products. The American Sheet & Tin Plate Co. made such a record, shipping a larger aggregate of its products, tinplates, black and galvanized sheets, blue annealed sheets and light plates, than in any previous month in its history. Many mills shipped larger tonnages than in any preceding August, this being particularly true in the pipe trade. August specifications were, on the whole, probably materially in excess of shipments, particularly in bars, plates, shapes and wire products, in which lines the surplus probably amounted to about 25 per cent.

The finished-steel trade seems to be done with spectacular advances; at any rate the United States Steel Corporation is understood to be strongly opposed to further advances of moment, and many at least of the leading independents hold the same view. The principle is that as relatively low-priced contracts extend through the year, any further advances would mark too great a disparity between expiring contracts and the new ones which would have to be made. In special cases, however, advances are likely to occur. It is practically certain that sheets will advance in the near future, probably by $2 a ton on black and $3 a ton on galvanized, while the tin mills will certainly advance prices before they begin to sell for next season. These advances would be predicted upon advances in the raw materials for sheet and tinplate making, sheet bars, spelter and pig tin, all three of which have been advancing sharply.

Activity in pig iron is increasing. Foundry iron is being taken freely, in a way that indicates heavy demand. Basic iron is also called for, and some large contracts are reported. Prices are firm and advancing. Stocks at furnaces are decreasing, and no rapid increase in active capacity can be expected, owing to the difficulty of obtaining coke and the scarcity of labor.

Birmingham

Sept. 2—Following the announcement that some sales of large proportion had been made during the month just past, it is given out that inquiries are in hand which indicate there is still a need for large tonnage of pig iron. The inquiries are for iron to be delivered during the first half of next year and $13 per ton, No. 2 foundry, is the lowest quotation that is stated. The sales in the main made during August will be delivered during the balance of the year and most likely through the first quarter of the coming year. Cast-iron pipe concerns in the Southern territory have prepared for a continued activity into next year and other consumers are said to be assured of activity. The sales made during the month of August by Southern pig-iron manufacturers call for a larger production of iron and preparations are well in hand for that condition.

Iron prices for the first quarter of the coming year will be on a basis of $13 per ton, No. 2 foundry, with a possible increase of 50c. per ton for delivery during the first half of the year. The greater portion of the sales made so far for delivery this year are on a basis of $12.50 per ton, No. 2 foundry.

The steel situation in Southern territory is almost everything that could be desired. There is activity at the big plant of the Tennessee Coal, Iron & R.R. Co. while the Southern Iron & Steel Co. is doing well at its plant at Gadsden, wire goods being in strong demand.

Cast-iron pipe makers are busy with orders in hand and in sight that will run far into next year. Pipe prices are improving right along. Foundries report improving conditions, in fact all branches of the trade are doing well with the future prospects bright.

Baltimore

Sept. 2—Exports for the week included 1,046,865 lb. steel plates to Rotterdam; 781,000 lb. old car wheels to Leith, Scotland; 2,184,220 lb. steel rails and 401,310 lb. track fastenings to St. Johns; 9,527,575 lb. miscellaneous iron and steel to Panama. Imports included 886 tons ferromanganese from Liverpool; 5050 tons manganese ore from Poti, Russia; 4700 tons pyrites from Huelva, Spain; 27,900 tons iron ore from Cuba.

Chicago

Sept. 2—A strong tone continues in the iron market, with pig iron in somewhat better demand and prices stiffening. On last-quarter business $12.50 Birmingham ($16.85 Chicago) for No. 2 foundry is generally quoted; on first-quarter deliveries 50c. more is obtained. A little iron is said to be obtainable in odd lots at less than $12.50. Northern No. 2 foundry brings $15.50@16 at the furnace, which represents about $16@16.50 delivered. For both Northern and Southern the demand is increasing, more melters showing a desire to contract for first-half requirements. Selling agents in general are holding out for the higher quotations on all business running into

next year, but there is much tonnage yet to be placed for the last quarter. Steady buying in small- to medium-sized lots is the policy of many melters and their aggregate purchases from week to week constitute a satisfactory record of sales from the furnace agent's point of view. Charcoal iron continues in good demand, at $16.50@17, Chicago.

The market for finished products continues strong despite higher prices in some lines. Local mills are crowded to their limit of production for this year; contracts for 1913 deliveries are not yet being generally made though the pressure for them is increasing. Bar iron holds to 1.40c. minimum with a large demand and steel bars are active at 1.48c. Railroad supplies are in increasing demand with the tendency of the roads to buy liberally for reconstruction and improvements. Structural material continues actively sought and difficult to obtain because of the pressure on the mills. Plates and sheets show a similar demand and scarcity of material for early delivery. The whole situation indicates a continuation of large demand for practically every line of finished products.

Cleveland

Sept. 2—Ore shipments are so heavy that some wild boats are finding employment. A few sales are still being made to furnaces which underestimated their requirements.

Pig Iron—The market is strong and sales are good. Quotations, Cleveland delivery, are $15.30 for bessemer, $14.25 for No. 2 foundry, $13.50@13.75 for gray forge and $18 for Jackson County silvery.

Finished Material—There is a good general demand. Iron bars are in special request, and 1.45c., Cleveland, is now quoted. Jobbers report good sales.

Philadelphia

Sept. 4—The hardening of pig-iron prices is stimulating inquiry and demand. It is the general opinion among consumers that a higher level of prices is very probable. Much business that is presented is for a later delivery than furnace interests care to take on at present quotations. There is a rumor current that some Southern furnaces are either negotiating or have recently answered inquiries looking to deliveries during the first half of next year but whether at current prices or at a little advance the rumor does not mention. Quite a number of furnaces which are well sold up are asking as much as 50c. advance, but this is not looked upon as a serious quotation. Yet it may turn out to be. Steelmaking pig iron is leading other kinds and additional large sales have just been made with more inquiries in sight at prices that a month ago would have been regarded as improbable. Stocks are steadily declining and output is slowly increasing. The most active inquirers are the larger interests throughout all the territory supplied from this market. No. 2 X foundry is quoted strong at $16.50; Virginia, $17; Pennsylvania forge, $16; basic, $16.50, and low phosphorus, $21.50. Surprises in purchases for distant delivery are liable any day.

Steel Billets—The pressure for steel billets is now mainly from the smaller concerns who are glad to escape the consequences of their carelessness by paying whatever prices that are quoted. Forging billets have been advanced to $30, but even higher prices have been paid for special accommodation.

Bars—Bars have advanced slightly in actual selling prices and orders are trooping in. Steel bars are hard to obtain except on delivery conditions named by the mills. Bars have been advanced $1 per ton.

Sheets—Sheet mills are willing to book business for first or second quarter next year, but their quotations are high and simply mean "take it or let it alone."

Pipes and Tubes—Quotations in tubes remain fixed and business is reported large, the heavier consumers ordering for future necessities. Merchant pipe is more active than for some weeks. Cast-pipe quotations have been advanced under stronger crude-iron quotations.

Plates—Plates have been advanced at least $1 a ton, but the bulk of the past week's business has been done on premium quotations. Sheared plates are quoted at 1.60c., with 1.65c. for universal shapes.

Structural Material—Much more business is being offered to the mills than is being accepted and there are no signs that this situation will be changed this month.

Scrap—The scrap dealers are having a harvest and their yards are practically empty except for certain ordinary lines and tentative orders are now in the hands of the dealers who are scouring the country for supplies.

Pittsburgh

Sept. 3—The close of the regular summer or vacation period has made no appreciable difference in the condition of the iron and steel trade. The July-August business was on the whole a record breaker in point of specifications, and the mills are now wondering whether September and October will show a larger total, as they do in normal times, when July and August have been dull. There are suspicions that many buyers desired to get ahead of the general run in specifying, and made a special point to specify heavily in August. If this was the case, their specifications may be lighter this month, and even in October also. A point of importance is that the mills have been able to render much better service than at any former time when they were under great pressure. They have not fallen behind in shipments nearly as much as they did in 1906 or 1909. In 1906, for instance, there was a long period in which the best delivery many of the mills could promise was six months. At this time the mills are making much better promises though a much larger tonnage has been specified. On a general average, specifications for steel products can be filled in from six to eight weeks.

Pig Iron—The August pig iron averages, compiled by a leading interest in the trade from actual sales reported, are announced at $14.534 for bessemer and $14 for basic, at Valley furnaces, against $14.25 for bessemer and $13.48 for basic in July. The Bessemer market is now higher, however, several small lots having sold lately at $14.75, while in the past few days at least one small lot has sold at $15 and several small lots are pending which are expected to go at $15. There are no large negotiations for bessemer. Basic iron has brought $14, Valley, and most furnaces are asking $14.25 or higher. There is very little foundry to be had at $14.25, Valley, for this year, and none at all for next year. We quote: Bessemer, $14.75@15; basic, $14@14.25; No. 2 foundry, $14.25@14.50; malleable, $14@14.50; forge, $13.75@14, all f.o.b. Valley furnaces, 90c. higher delivered Pittsburgh.

Ferromanganese—There is a moderate amount of selling at the $2.50 advance noted in last report, for forward delivery, while prompt material is scarce and sometimes brings a premium. The general market is $53.50, Baltimore.

Steel—The market has been advancing sharply, owing to an insistent demand with very little steel offered. Most of the large mills are now out of the market, being practically sold up for this year and being unwilling to quote for next year. Finishing mills are paying higher prices than are justified by the rates at which their finished product is sold, merely to give service to their customers and keep their order books clearer for later deliveries, when they expect to realize better prices for their finished product. Some purchases lately made are almost spectacular in the advances paid over what could have been done a week or two earlier, and the market is advancing at a pace rarely seen. A round tonnage of openhearth steel, running well into the thousands of tons, has been taken at a price higher than a basis of $24, maker's mill, Pittsburgh, for openhearth billets, and openhearth sheet bars have been quoted at $25, maker's mill, with the prospect that the steel will eventually be taken at this figure. The market is not closely quotable, as it

changes overnight, and sellers rarely make a quotation except for acceptance the same day. We quote as approximately representing the market: Bessemer billets, $23@23.50; bessemer sheet bars, $23.50@24; openhearth billets, $24@24.50; openhearth sheet bars, $24.50@25; rods, $25.50@26, f.o.b. maker's mill, Pittsburgh or Youngstown.

Sheets—The market is very strong, with shipments extremely heavy and specifications equally heavy. Several of the independents have lately been selling into next year at present prices, but the leading interest is not doing so, except that it has made contracts with special consumers which run into next year. It is probable that sheets will advance within a fortnight, by $2 a ton on black and $3 a ton on galvanized, which would increase the spread between black and galvanized from 1.10c. to 1.15c. The increased spread is more than justified by the high price of spelter, whereas a 1.15c. spread has sometimes obtained in the past when spelter was lower. We quote the market at present at 1.50c. for blue annealed, 10 gage, 2.05c. for black, 28 gage, 3.15c. for galvanized, 28 gage, 2.20@2.25c. for painted corrugated, 28 gage, and 3.20c. for galvanized corrugated, 28 gage.

Connellsville Coke—The market for prompt furnace is 5@10c. higher this week, sales being made of 10,000 tons or more for prompt and September at $2.30 and $2.35, and $2.40 in one instance, for a specially desirable brand. No fresh contracts for the remainder of the year are reported. It is questionable whether $2.25 can be done any longer on contract.

Sept. 4 (By Telegraph)—Independent tinplate makers advanced their price 10c., or $2 per ton, making it $3.60 base for 100-lb. cokes. They will not sell for 1913 delivery before October. The American Sheet & Tin Plate Co. has made no official advance, but is sold up for this year and is not selling for 1913. The independent advance makes the market for tinplates, which is now quotable at $3.60 base per box.

Foreign Iron Trade

German Iron Production—Pig-iron production in Germany in July was 1,468,011 metric tons, being 49,566 tons more than in June. For the seven months ended July 31 the make was as follows:

	1911	1912	Changes	
Foundry iron	1,776,561	1,843,283	I.	66,722
Forge iron	324,279	309,997	D.	14,282
Steel pig	1,005,797	1,224,841	I.	219,044
Bessemer pig	204,169	227,668	I.	23,499
Thomas(basic)pig	5,661,939	6,286,854	I.	624,915
Total	8,972,745	9,892,643	I.	919,898

The total increase this year was 10.3%. Steel pig includes spiegeleisen, ferromanganese and all similar alloys.

Metal Markets

New York, Sept. 4—The metal markets have been generally strong and inclined to be active. Tin has had another sharp advance.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal	Exports	Imports	Excess
Gold			
July 1912..	$ 7,263,624	$ 3,747,869 Exp.	$3,515,755
" 1911..	2,178,088	2,594,653 Imp.	416,565
Year 1912..	40,660,460	29,012,211 Exp.	11,648,249
" 1911..	15,429,650	36,367,679 Imp.	20,938,029
Silver			
July 1912..	6,591,054	3,449,716 Exp.	3,141,338
" 1911..	5,275,008	3,920,794 Exp.	1,354,214
Year 1912..	40,260,276	28,713,965 Exp.	11,546,311
" 1911..	39,718,211	25,881,395 Exp.	13,836,816

Exports from the port of New York, week ended Aug. 31: Gold, $600; silver, $1,851,971, chiefly to London and Paris. Imports: Gold, $606,096; silver, $223,004, principally from Mexico and South America.

Gold—The price of gold on the open market in London remains at the Bank level, 77s. 9d. per oz. for bars, and 76s. 4d. per oz. for American coin. Exports reported last week included £183,000 to India and £700,000 to South America, besides a considerable amount to Germany.

Iridium—This metal is quoted at $63@64 per oz., New York.

Platinum—There is still talk of lower prices, but foreign holders seem to be able to keep prices up, notwithstanding their reported holdings of large stocks. Dealers here still ask $45.50 per oz. for refined platinum and $48 per oz. for hard metal.

Silver—The market advanced this week on buying by the Indian Bazaars, touching 29 1/16d. in London on Aug. 31. Since then price has reacted on lack of orders on account of holidays in India and closes dull at 28 7/8d. with buyers satisfied.

SILVER AND STERLING EXCHANGE

Aug.-Sept.	29	30	31	2	3	4
New York....	62 5/8	62 5/8	63 1/4	....	62 3/4	62 3/4
London.....	28 11/16	28 11/16	29 1/16	28 11/16	28 7/8	28 11/16
Sterling Ex..	4.8740	4.8715	4.8695	....	4.8675	4.8655

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver. 0.925 fine.

Exports of silver from London to the East, Jan. 1 to Aug. 22, as reported by Messrs. Pixley & Abell:

	1911	1912	Changes	
India.....	£5,100,600	£5,087,700	D.	£ 12,900
China.... ...	890,400	933,500	I.	43,100
Total.....	£5,991,000	£6,021,200	I.	£ 30,200

India Council bills in London averaged 16.03d. per rupee for the week.

Imports of gold into Great Britain, seven months ended July 31, were £29,712,028; exports, £21,423,795; excess of imports, £8,288,231, against £9,945,522 last year.

Copper, Tin, Lead and Zinc

NEW YORK

Aug.-Sept.	Copper: Lake, Cts. per lb.	Copper: Electrolytic, Cts. per lb.	Tin: Cts. per lb.	Lead: New York, Cts. per lb.	Lead: St. Louis, Cts. per lb.	Zinc: New York, Cts. per lb.	Zinc: St. Louis, Cts. per lb.
—	17 5/8	17.57 1/2			4.55	7.15	7.00
29	@17 3/4	@17.60	46 3/4	4.65	@4.60	@7.20	@7.05
	17 5/8	17.55			4.75	7.20	7.05
30	@17 3/4	@17.60	47 3/4	4.85	@4.77 1/2	@7.25	@7.10
	17 5/8	17.55			4.75	7.25	7.10
31	@17 3/4	@17.60	47 3/4	4.85	@4.77 1/2	@7.27 1/2	@7.12 1/2
2	.....	.....	....	....	.....	.....	.....
	17 5/8	17.52 1/2			4.75	7.27 1/2	7.12 1/2
3	@17 3/4	17.57 1/2	47 3/4	4.85	@4.77 1/2	@7.30	@7.15
	17 5/8	17.52 1/2			4.75	7.27 1/2	7.12 1/2
4	@17 3/4	17.57 1/2	47 1/4	4.85	@4.77 1/2	@7.32 1/2	@7.17 1/2

The quotations for copper, lead, spelter and tin are for wholesale contracts with consumers, without distinction as to deliveries; and are representative, as nearly as possible, of the bulk of the transactions, reduced to basis of New York, cash, except where St. Louis is specified as the basing point. The quotations for electrolytic copper are for cakes, ingots and wirebars. The price of electrolytic cathodes is usually 0.05 to 0.10c. and that for casting copper usually about 0.125 to 0.2c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market for good ordinary brands, both desilverized and non-desilverized; specially refined corroding lead commands a premium. The quotations on spelter are for ordinary Western brands; special brands command a premium.

LONDON

Aug.-Sept.	Copper: Spot	Copper: 3 Mos	Copper: Best Sel'td	Tin: Spot	Tin: 3 Mos	Lead, Spanish	Zinc, Ordinaries
29	78 11/16	79 5/16	84 1/4	213	212	20 1/2	26 3/4
30	79 3/16	79 1/2	84 1/4	218 1/4	217 1/2	20 1/2	26 5/8
31	....	....	.....	.....	.....	....	....
2	79 5/16	79 3/4	84 1/2	216 1/4	214 3/4	20 1/2	26 3/4
3	78 11/16	79 3/8	84 1/4	216 3/4	214 1/4	20 3/4	26 3/4
4	78 11/16	79 1/4	84 1/4	216 1/4	214	21 1/4	26 3/4

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent. discount. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17½c.; £15 = 3.26c.; £25 = 5.44c.; £70 = 15.22c. Variations, £1 = 21¾c.

Copper—Even before the holiday the market was beginning to look tired, the demand both for Europe and America having dwindled, Europe being undoubtedly affected by the relapse in the standard market. There has again been reports that European buyers are being supplied with relatively cheap copper out of stock on their side. In our own market there has been a disposition to attract business by concessions, both for export to Europe and for delivery in Connecticut and elsewhere in this country. Since Monday sales of electrolytic

have been made at 17.55c., cash, New York. Lake has sold at 17⅝@17¾c. Some producers of Lake report a good business while others report none at all. On the whole the tone of the market has been easy. However, there seems to be no doubt as to the maintenance of a high rate of consumption, both here and abroad. In this country the operations of manufacturers seem to be limited only by their inability to obtain the necessary labor to run their plants. At the close Lake copper is quoted 17⅝@ 17¾c.; electrolytic, in cakes, wirebars or ingots 17.52½ to 17.57½c.; while casting copper is quoted nominally at 17⅜@17½c. as an average for the week.

The London standard market has been quiet and has fluctuated within narrow limits, spot standard moving from £78 16s. 3d. to £79 6s. 3d. and back again to £78 16s. 3d. at the close for spot and £79 5s. for three months.

Copper sheets are 23@24c. per lb., base for large lots. Full extras are charged and higher prices for small quantities. Copper wire is 19@19¼c. base, carload lots at mill.

Copper exports from New York for the week were 6725 long tons. Our special correspondent gives the exports from Baltimore at 2491 tons for the week.

Visible stocks of copper in Europe Aug. 31 are reported as follows: Great Britain, 29,450; France, 7890; Rotterdam, 550; Hamburg, 4610; afloat from Chile, 2600; afloat from Australia, 5600; total, 50,700 long tons, or 113,568,000 lb. This is a decrease of 530 tons from the Aug. 15 report.

Tin—The market has developed great strength, due primarily to the very strong statistical position. The visible supply of tin is now 11,285 tons, the smallest quantity on hand since 1906. The deliveries into consumption during August were very large, amounting to 4300 tons. The demand from consumers has been very good, and besides, there has been a strong bull movement in London, in consequence of which prices have considerably advanced; in fact, spot tin has been ruling at the highest price on record since June, 1911, and three months' tin is actually selling at a record figure.

In New York, the market advanced to 47¾ on Aug. 30, and closes on Sept. 4 at 47¼ cents.

In London, spot closed on Aug. 29 at £213 and three months at £212. Ou Aug. 30 it advanced over £5. A slight reaction took place on Aug. 3 to £216 15s. for spot and £214 5s. for three months. The market closes on Aug. 4 at £216 5s. for spot and £214 for three months.

Visible stocks of tin on Aug. 31 are reported as follows: London, 5981; Holland 975; United States, excluding Pacific ports, 4329; total, 11,285 long tons, a decrease of 2061 tons during August.

Lead—The market is strong and advancing; consumption is excellent and stocks appear to be small. On Friday, Aug. 30, the principal producer advanced its price to 4.85c., New York, at which figure there has been a good business. St. Louis is quoted at 4.75@4.77½ cents.

The London market for lead continues to advance and metal for early delivery is very scarce. At the close, Spanish lead is quoted £21 5s.; English lead, 2s. 6d. higher.

Spelter—The market has advanced smartly, the movement being attributed especially to the covering of some speculative contracts. Some business has been done with consumers, but the demand from them has not been large. A fundamental cause for the movement is probably the conviction that production is experiencing a falling off. Anyway, the situation in the Kansas-Oklahoma gas-fields is reported to be becoming acute and the works at Altoona, Bartlesville, Caney, Dearing. Neodesha and Cherryvale are reported to be operating at reduced capacity. This offers some relief to the previous shortage of ore and the smelting margin is again satisfactory. Calamine is again being imported from Mexico, partly because of the shortage of other ore supply and partly because this kind of ore requires less gas for smelting than in the case of blende. The spelter produced from imported ore is now being entered for domestic consumption, which, of course, has an influence both upon our own market and upon the European. At the close St. Louis is quoted at 7.12½@7.17½c.; New York 7.27½@ 7.32½ cents.

The London market for spelter is firm, good ordinaries being quoted £26 15s.; specials 5s. higher.

The smelting works of the American Zinc, Lead & Smelting Co. at Hillsboro, Ill., have been put in operation.

Base price of zinc sheets is $8.75 per 100 lb., f.o.b. La Salle-Peru, Ill., less 8% discount.

Other Metals

Aluminum—Business is steady, and metal is still rather scarce for early delivery. The current quotation is 24¼@ 24½c. per lb. for No. 1 ingots, New York.

Antimony—The market is firm and fairlyy active. Sales at lower prices from second hands are gradually being eliminated. Cookson's is quoted 8.45c. per lb.; Hallett's and U. S., 7.95@8.05c., while 7.45@7.70c. is asked for Chinese, Hungarian and other outside brands.

Quicksilver—The market is firmer, but prices here are unchanged so far. New York quotations are $42 per flask of 75 lb., with 60c. per lb. for retail lots. San Francisco, $41.50 for domestic orders and $39 for export. The London price has been advanced 10s. and is now £8 5s. per flask, with £8 quoted from second hands.

Zinc and Lead Ore Markets

Platteville, Wis., Aug. 31—The base price paid this week for 60% zinc ore was $54@55. The base price of 80% lead ore was $58@59 per ton.

SHIPMENTS, WEEK ENDED AUG. 31

Camps	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Benton	1,030,100	.....	596,000
Highland	774,900	.....	.....
Mineral Point	652,120	.....	.....
Galena	473,600	.....	.....
Shullsburg	454,000	.....	.....
Hazel Green	360,000	.....	.....
Platteville	323,000	.....	90,400
Harker	254,720	.....	.....
Cuba City	162,880	.....	458,660
Dodgeville	52,250	.....	.....
Total	4,537,570	.....	1,145,060
Year to date	138,356,950	5,887,420	23,471,430

Shipped during week to separating plants, 2,089,140 lb. zinc ore.

Joplin, Mo., Aug. 31—The high price of zinc-sulphide ore this week was $59, the price per ton of 60% zinc $53@56. Zinc silicate sold at $29@31 per ton of 40% zinc. The average, all grades of

SHIPMENTS, WEEK ENDED AUG. 31

	Blende	Calamine	Lead Ore	Value
Webb City-Carterville	4,385,590	.....	861,360	$138,910
Joplin	2,572,240	.....	305,100	80,865
Duenweg	683,060	.....	58,730	20,770
Galena	627,620	.....	54,610	18,780
Miami	431,310	.....	276,970	18,535
Alba-Neck	490,160	.....	25,500	14,930
Granby	53,190	452,900	16,860	9,150
Carl Junction	286,110	.....	.....	6,865
Oronogo	336,600	.....	.....	6,795
Spurgeon	71,350	143,350	4,000	4,170
Lawton	91,480	.....	.....	2,560
Cave Springs	59,810	.....	.....	1,615
Aurora	.....	87,850	.....	1,490
Totals	10,039,220	684,100	1,603,130	$325,425
8 mos	361,981,470	22,481,070	61,635,360	$11,493,460

Blende val., the week, $269,005; 8 mos., $9,438,294
Calamine, the week, 11,280; 8 mos., 342,192
Lead value, the week, 45,140; 8 mos., 1,713,474

MONTHLY AVERAGE PRICES

Month	Zinc Ore: Base Price		Zinc Ore: All Ores		Lead Ore: All Ores	
	1911	1912	1911	1912	1911	1912
January	$41.85	$44.90	$40.55	$43.54	$55.68	$58.92
February	40.21	45.75	39.16	43.31	54.46	52.39
March	39.85	51.56	38.45	49.25	54.57	54.64
April	38.88	52.00	37.47	50.36	56.37	54.18
May	38.25	55.30	36.79	53.27	55.21	52.45
June	40.50	55.88	38.18	54.38	56.49	55.01
July	40.75	58.85	38.36	56.59	58.81	58.83
August	42.50	55.13	41.28	53.27	60.74	57.04
September	42.63	.....	41.29	.....	59.33	.....
October	42.38	.....	40.89	.....	54.72	.....
November	45.40	.....	43.25	.....	57.19	.....
December	44.13	.....	40.76	.....	62.03	.....
Year	$41.45	.....	$39.90	.....	$56.76	.....

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

zinc, $52.70. Lead sold as high as $60 per ton, 80% grades receiving $55@56. All grades averaged $56.30 per ton. There is a move on foot to buy lead, as zinc, on the actual dry weight.

The shipment this week was considerably short of the past two weeks, but a large tonnage purchased this week at advanced prices for next week's delivery insures a heavier tonnage again next week.

It is reported here that the Mineral Point Zinc Co. has secured contracts on the larger portion of the Wisconsin output, which is forcing some of the smelting companies to secure a larger tonnage in this district.

Chemicals

New York, Sept. 4—The Universal Chemical Co. has been organized with an authorized capital of $30,000,000. It is not known who is behind the new company.

Copper Sulphate—Prices are unchanged at $5.50 per 100 lb. for carload lots, and $5.75 per 100 lb. for smaller parcels.

Arsenic—Supplies are still scarce and quotations are $4.50@5 per 100 lb. for white arsenic.

Nitrate of Soda—Demand is good and prices firm at 2.52½c. per lb. for spot nitrate and 2.55@2.57½c. for futures.

CURRENT WHOLESALE PRICES

Ammonium sulphate.....cwt.	3.25@3.28
Arsenic, white.....lb.	0.04½@0.05
Barytes, ground.....sh. ton	12.50@14.00
" floated.....sh. ton	16.00@17.00
Calcium acetate, gray.....cwt.	2.50@2.55
carbide, tons lot f.o.b. Niagara Falls...sh. ton	70.00
Carbons, good drill quality....carat	85.00
Cement, Port., Am.....400-lb. bbl.	1.33
Chrome brick, f.o.b., Pittsburg...M.	175.00
ore, 50%, ex-ship, N. Y., lg. ton	14.00@16.00
Copperas, bulk.....cwt.	0.55
bbl.....cwt.	0.65@0.85
Copper sulphate.....cwt.	5.50@5.75
Fluorspar, lump, f.o.b. Pittsburg.ton	8.00@9.00
Magnesite, crude, 95%....lg. ton	10.00@11.00
calcined, powdered.....	30.00@35.00
brick, dom., f.o.b. Pittsburg.....M.	160@180
Paints, litharge, Am. powd.....lb.	0.07@0.07½
red lead, American.....lb.	0.07@0.07½
white lead, Am., dry.....lb.	0.05½@0.06½
zinc white, Am., dry.....lb.	0.05½@0.06½
Phosphates, acid:	
*Fla., hard rock 77%.....	5.75@6.25
land pebble 68%.....	3.70@3.80
†Tenn., 78@80%.....	5.00@5.50
75%.....	4.75@5.00
68@72%.....	4.25@4.50
†So. Car. land rock 60%.....	3.50@3.75
Potassium cyanide, 98@99%....lb.	0.19
Pyrite:	
Domestic, non-arsenical, furna e size, f.o.b. R.R. per unit.....	0 12@0.12½
Domestic, non-arsenical, fines, per unit, f.o.b. mines.....	0.11½@0.12
Imported, non-arsenical, furnace size, ex-ship, per unit.....	0.13½
Imported, arsenical, furnace size, size, ex-ship, per unit.....	0.12½@0.13
Imported, fines, arsenical, ex-ship.	0.11@0.12
Imported, fines non-arsenical, ex-ship, per unit.....	0.12½
Pyrite prices are per unit of sulphur. A deduction of 25c. per ton is made when ore is delivered in large lumps.	
Sodium cyanide, 120 to 130% KCN (per 100%).....lb.	0.18
nitrate 95% spot.....cwt.	2.52½
95% future....cwt.	2.55
Sulphur, Louisiana prime, N. Y, lg. ton	22.00@22.50
roll.....cwt.	1.85@2.15
flour.....cwt.	2.00@2.40
flowers, sublimed.....cwt.	2.20@2.60
pow. com., bags.....cwt.	1.50
Sicilian, crude brimstone lg. ton	22.50
Zinc chloride, granular.....lb.	0.04½@0.04½

*F.o.b. Florida or Georgia ports. †F.o.b. Mt. Pleasant. †On vessel Ashley River, S.C.

Note—These quotations are for ordinary wholesale lots in New York unless otherwise specified, and are generally subject to the usual trade discounts. In the cases of some of the important minerals, such as phosphate rock, pyrites and sulphur, in which there are well established markets, the quotations are substantially representative. But in the cases of some of the minor mineral products, the quotations represent what dealers ask of consumers and not what producers can realize in their selling output on private contract.

Petroleum

California oil production in July is reported at 7,580,748 bbl.; deliveries, 6,982,646 bbl.; stocks at close of the month, 48,022,469 bbl. There were 64 wells completed in July, and 408 under the drill.

MINING STOCKS

New York, Sept. 4—On Aug. 29 the Exchange was quiet, with light business and no important changes. On the Curb copper stocks were in some demand, but prices show little change. Other mining stocks were dull.

Aug. 30 the Exchange was dull. On the Curb copper stocks were weaker. Cobalts sold rather freely at slight declines. Other mining stocks were quiet.

The Exchange adjourned fr m Friday, Aug. 30, over to Tuesday, Sept. 3, on account of the Labor Day holiday.

Sept. 3 and 4, after the recess, the Exchange continued dull and unsettled, with small recessions in price. The Curb was also dull with rather limited trading. Copper stocks were fairly steady, with few price changes. Other mining stocks were inclined to be weak, and were not in active demand.

In Baltimore, Aug. 30, a sale of 1700 shares common stock Alabama Consolidated Coal & Iron Co., pledged as collateral, brought $8.08 per share for 100 shares, and $5.50 per share for the remaining 1600 shares.

Boston, Sept. 2—After making new high records for the year in many cases, stock prices have settled somewhat. The market for copper shares can be said to be healthy in tone with future promise, judging from the continued demand for the metal. The Hayden, Stone & Co. floatation of the Alaska Gold Mines Co. has been watched with keen interest and allotments were but 25% of original subscriptions in most cases. The firm's customers and particular friends were about the only beneficiaries, although good-sized blocks went abroad. With $5 paid in the price rose to $9.12½ on the Curb, although it reacted from this to $7.25 on knowledge of the allotments and desire to get quick profits.

Calumet & Arizona, Granby, North Butte and Old Dominion were the particularly strong features during the week. The last company is expected to increase the dividend beyond the present $3 rate at its next period. Fairly active trading in Keweenaw caused the price to advance

COPPER SMELTERS' REPORTS

This table is compiled from reports received from the respective companies, except in the few cases noted (by asterisk) as estimated, together with the reports of the U. S. Dept. of Commerce as to imported material, and in the main represents the crude copper content of blister copper, in pounds. In those cases where the copper contents of ore and matte are reported, the copper yield thereof is reckoned at 95%. In computing the total American supply duplications are excluded.

Company	June	July	August
Alaska shipments.	4,134,569	2,224,441	.....
Anaconda.....	22,750,000	23,000,000	25,250,000
Arizona, Ltd.....	3,300,000	3,200,000	.....
Copper Queen.....	7,622,730	7,708,147	.....
Calumet & Ariz....	4,160.000	4,748,000	.....
Chino.....	1,474,979	2,945,000	3,437,309
Detroit.....	1,959,634	2,194,090	.....
East Butte.....	.....	.....	.....
Mammoth.....	.....	.....	.....
Mason Valley.....	1,438,580	1,500,000	.....
Nevada Con.....	5,913,832	6,024,274	.....
Ohio.....	665,000	617,500	.....
Old Dominion.....	2,130,000	.....	.....
Ray.....	3,004,195	2,985,965	.....
Shannon.....	1,270,000	1,446,000	1,400,000
South Utah.....	162,335	142,555	.....
United Verde*.....	2,500,000	.....	.....
Utah Copper Co....	8,772,742	10,602,000	.....
Lake Superior*....	15,600,000	19,500,000	.....
Non-rep. mines*...	8.300,000	8,970,000	.....
Total production	.....	.....	.....
Imports, bars, etc.	24,262,292	.....	.....
Total blister.....	.....	.....	.....
Imp. in ore & matte	8,494,936	.....	.....
Total American..	.....	.....	.....
Miami†.....	2,683,310	3,027,710	3,048,750
Brit. Col. Cos.:			
British Col. Copper	996,000	1,026,000	.....
Granby	1,888,400	.....	.....
Mexican Cos.:			
Boleo†.....	1,851 920	2,386,480	.....
Cananea	4,310,000	4,000,000	.....
Moctezuma	3,176,819	3,094,016	.....
Other Foreign:			
Cape Cop., S. Africa	.....	.....	.....
Kyshtim, Russia...	.....	.....	.....
Spassky, Russia....	757,120	795,200	.....
Famatina, Argen..	.....	.....	.....
Tilt Cove, Newf'd..	.....	.....	.....
Exports from:			
Chile.....	9,856,000	8,960,000	.....
Australia.....	8,176,000	8,288,000	.....
Arrivals in Europe‡	12,667,200	14,114,240	.....

†Boleo copper does not come to American refiners. Miami copper goes to Cananea for treatment, and reappears in imports of blister.

‡Does not include the arrivals from the United States, Australia or Chile.

STATISTICS OF COPPER.

Month	U.S.Refin'y Product'n	Deliveries, Domestic	Deliveries for Export
VIII, 1911.....	125,493,667	59,935,364	69,855,660
IX.....	115,588,950	57,311,584	50,824,011
X.....	118,255,442	64,068,307	60,084,349
XI.....	111,876,601	68,039,776	67,049,279
XII.....	122,896,697	65,988,474	79,238,716
Year	1,431,938,338	709,611,605	754,902,233
I, 1912.....	119,337,753	62,343,901	80,167,904
II.....	116,035,809	56,228,368	63,148,096
III.....	125,694,601	67,487,466	58,779,566
IV.....	125,464,644	69,513,846	53,252,326
V.....	126,737,836	72,702,277	69,485,945
VI.....	122,315,240	66,146,229	61,449,650
VII.....	137,161,129	71,094,381	60,121,331
VIII.....	.....	.....	.....

VISIBLE STOCKS

	United States	Europe	Total
IX, 1911.....	133,441,501	191,228,800	324,670,301
X.....	140,894,856	191,945,600	332,840,456
XI.....	134,997,642	176,825,600	311,823,242
XII.....	111,785,188	164,281,600	276,066,788
I, 1912.....	89,454,695	158,323,200	247,777,895
II.....	66,280,643	154,851,200	221,131,843
III.....	62,939,988	141,142,400	204,082,387
IV	62,367,557	136,819,200	199,186,757
V.....	65,066,029	134,176,000	199,242,029
VI.....	49,615,643	117,801,600	167,417,243
VII.....	44,335,004	108,186,000	152,521,004
VIII.....	50,280,421	113,299,200	163,579,621
IX.....	.....	113,568,000	.....

to $2.50. This is due to plans to consolidate this company with Ashbed, Humboldt, Meadow and others of more or less promise. Outside of Alaska Gold, trading on the Curb was quiet, although a firm tone was maintained in the better class of issues.

Assessments

Company	Delinq	Sale	Amt
Belcher, Nev	Aug. 15	Aug. 30	$0.10
Belmont, Ida	July 22	Aug. 22	0.002
Black Pine M. & M., Utah	Aug. 29	Sept. 19	0.00½
Cedar Talisman, Utah	Sept. 14	Oct. 3	0.00½
Con. Virginia, Nev	Aug. 11	Sept. 5	0.20
Dalmatia, Ida	Aug. 24	Sept. 21	0.002
Dennemora, Ida	July 20	Aug. 20	0.002
Eagle Mt., Ida	July 31	Aug. 22	0.00½
Empire, Ida	Sept. 23	Oct. 23	0.002
Hilarity, Ida	Sept. 5	Oct. 5	0.002
Horseshoe Ida	Aug. 8	Aug. 30	0.002
JohnnyGold M.&M.Co., Utah	Aug. 30	Sept. 20	0.00⅝
Laclede, Ida	Aug. 1	Aug. 24	0.003
Little Butte, Ida	Sept. 21	Oct. 21	0.001
Lone Star, Nev	July 20	.....	0.02
Manhattan Red Top, Nev	July 12	.....	0.01½
Mineral Hill, Nev	Aug. 5	Oct. 5	0.01
New Hope, Ida	Sept. 3	Oct. 3	0.002
New Reliance, S. Dak	.....	.....	0.01
Ohio Copper, Utah	Aug. 28	.....	0.50
Reindeer, Ida	Sept. 7	Oct. 5	0.003
Sandstorm-Kendall, Nev	July 8	.....	0.01
Seven Troughs Mon'h, Utah	Aug. 10	Aug. 30	0.0½
Smuggler, Utah	Aug. 20	Sept. 20	0.00½
Springfield, Ida	July 30	Aug. 31	0.002
Tonopah North Star, Nev	July 15	.....	0.02
Twin Star, Ida	Aug. 31	Sept. 28	0.02
Wasatch, Utah	Sept. 27	Oct. 16	0.01

Monthly Average Prices of Metals

SILVER

Month	New York			London		
	1910	1911	1912	1910	1911	1912
January	52.375	53.795	56.260	24.154	24.865	25.887
February	51.534	52.222	59.043	23.794	24.081	27.190
March	51.454	52.745	58.375	23.690	24.324	26.875
April	53.221	53.325	59.207	24.483	24.595	27.284
May	53.870	53.308	60.880	24.797	24.583	28.038
June	53.462	53.043	61.290	24.651	24.486	28.215
July	54.150	52.630	60.654	25.034	24.236	27.919
August	52.912	52.171	61.606	24.428	24.032	28.375
September	53.295	52.440	.....	24.567	24.209	.....
October	55.490	53.340	.....	25.596	24.594	.....
November	55.635	55.719	.....	25.680	25.649	.....
December	54.428	54.905	.....	25.160	25.349	.....
Year	53.486	53.304	.....	24.670	24.592	.....

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

COPPER

	New York				London, Standard	
	Electrolytic		Lake			
	1911	1912	1911	1912	1911	1912
January	12.295	14.094	12.680	14.337	55.600	62.760
February	12.256	14.084	12.611	14.329	54.974	62.893
March	12.139	14.698	12.447	14.868	54.704	65.884
April	12.019	15.741	12.275	15.930	54.034	70.294
May	11.989	16.031	12.214	16.245	54.313	72.352
June	12.385	17.234	12.611	17.443	56.365	78.259
July	12.463	17.190	12.720	17.353	56.673	76.636
August	12.405	17.498	12.634	17.644	56.266	78.670
September	12.201	.....	12.508	.....	55.253	.....
October	12.189	.....	12.370	.....	55.170	.....
November	12.616	.....	12.769	.....	57.253	.....
December	13.552	.....	13.768	.....	62.068	.....
Year	12.376	.....	12.634	.....	55.973	.....

New York, cents per pound, London, pounds sterling per long ton of standard copper.

TIN AT NEW YORK

Month	1911	1912	Month	1911	1912
January	41.255	42 529	July	42 400	44 519
February	41 614	42.962	August	43 319	45.857
March	40.157	42.577	September	39 755	.....
April	42 185	43.923	October	41.185	.....
May	43.115	46.053	November	43.125	.....
June	44.606	45 815	December	44.655	.....
			Av. Year	42.281	.....

Prices are in cents per pound.

LEAD

Month	New York		St. Louis		London	
	1911	1912	1911	1912	1911	1912
January	4.483	4.435	4.334	4.327	13.009	15.619
February	4.440	4.026	4.266	3.946	13.043	15.738
March	4.394	4.073	4.238	4.046	13.122	15.997
April	4.412	4.200	4.262	4.118	12.889	16.331
May	4.373	4.194	4.223	4.072	12.984	16.509
June	4.435	4.392	4.292	4.321	13.260	17.588
July	4.499	4.720	4.397	4.603	13.530	18.544
August	4.500	4.569	4.406	4.452	14.260	19.679
September	4.485	.....	4.356	.....	14.744	.....
October	4.265	.....	4.139	.....	15.332	.....
November	4.298	.....	4.181	.....	15.821	.....
December	4.450	.....	4.332	.....	15.648	.....
Year	4.420	.....	4.286	.....	13.970	.....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month	New York		St. Louis		London	
	1911	1912	1911	1912	1911	1912
January	5.452	6.442	5.302	6.292	23.887	26.642
February	5.518	6.499	5.368	6.349	23.276	26.661
March	5.563	6.626	5.413	6.476	23.016	26.048
April	5.399	6.633	5.249	6.483	23.743	25.644
May	5.348	6.679	5.198	6.529	24.375	25.790
June	5.520	6.877	5.370	6.727	24.612	25.763
July	5.695	7.116	5.545	6.966	25.006	26.174
August	5.953	7.028	5.803	6.878	26.801	26.443
September	5 869	.....	5.719	.....	27.750	.....
October	6.102	.....	5.951	.....	27.256	.....
November	6.380	.....	6.223	.....	26.795	.....
December	6.301	.....	6.151	.....	26.849	.....
Year	5.758	.....	5.608	.....	25.281	.....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

PIG IRON AT PITTSBURG

	Bessemer		Basic		No. 2 Foundry	
	1911	1912	1911	1912	1911	1912
January	$15.90	$15.12	$14.40	$13.32	$14.75	$14.00
February	15.90	15.03	14.50	13.28	14.81	14.01
March	15.90	14.95	14.65	13.66	14.96	14.10
April	15.90	15.13	14.65	13.90	15.00	14.15
May	15.90	15.14	14.30	13.90	14.72	14.12
June	15.90	15.15	14.06	14.11	14.56	14.22
July	15.90	15.15	14.03	14.38	14.53	14.38
August	15.90	15.43	14.00	14.90	14.47	14.85
September	15.90	.....	13.57	.....	14.40	.....
October	15.43	.....	13.44	.....	14.34	.....
November	14.92	.....	13.30	.....	14 25	.....
December	15.15	.....	13.10	.....	13.90	.....
Year	$15.72	.....	$13.94	.....	$14.49	.....

STOCK QUOTATIONS

COLO. SPRINGS Sept. 3

Name of Comp.	Bid.
Acacia	.04⅞
Cripple Cr'k Con.	.02
C. K. & N.	.16½
Doctor Jack Pot	.06
Elkton Con.	.65½
El Paso	1.14
Findlay	.07½
Gold Dollar	.18
Gold Sovereign	.02
Isabella	.20½
Jack Pot	.05
Jennie Sample	‡.06⅜
Lexington	.009
Moon Anchor	‡ .009
Old Gold	.03⅞
Mary McKinney	.71½
Pharmacist	.01¼
Portland	.97
Vindicator	.85
Work	.01½

SALT LAKE Sept. 3

Name of Comp.	Bid.
Beck Tunnel	.09
Black Jack	.13
Cedar Talisman	.00¾
Colorado Mining	.18
Columbus Con	.18
Crown Point	‡ .02½
Daly-Judge	‡5.75
Grand Central	.57
Iron Blossom	1.27½
Little Bell	.30
Lower Mammoth	.05
Mason Valley	12.00
May Day	.14½
Nevada Hills	1.92½
New York	‡ .03
Prince Con	1.75
Silver King Coal'n	2.95
Sioux Con	.04½
Uncle Sam	.15
Yankee	‡.11

TORONTO Sept. 3

Name of Comp.	Bid	Name of Comp.	Bid
Coniagas	7 50	Hollinger	12 00
Hudson Bay	65.00	Imperial	.02
Temiskaming	38	Pearl Lake	.16
Wettlaufer-Lor	.41	Porcu. Gold	.21
Apex	.02	Porcu. Tisdale	.02
Central	‡5 56	Preston E. D	03
Crown Chartered	.06	Rea	.25
Dobie	25	Standard	‡.00½
Dome Exten	.10	Swastika	.08
Foley O'Brien	.14	West Dome	.05

SAN FRANCISCO Aug. 29

Name of Comp.	Clg.
COMSTOCK STOCKS	
Alta	.09
Belcher	.40
Best & Belcher	.08
Caledonia	1.50
Challenge Con	.09
Chollar	.10
Confidence	.75
Con. Virginia	.54
Crown Point	.40
Gould & Curry	.03
Hale & Norcross	.11
Mexican	2.92
Occidental	.50
Ophir	.91
Overman	.90
Potosi	.03
Savage	.07
Sierra Nevada	.16
Union Con	.73
Yellow Jacket	.41

Name of Comp.	Bid
MISC. NEV. & CAL.	
Belmont	9.70
Jim Butler	.66
MacNamara	.24
Midway	.59
Mont.-Tonopah	2.25
North Star	.21
West End Con	1.70
Atlanta	.26
Booth	.07
C.O.D. Con	.11
Comb. Frac	.15
Jumbo Extension	.43
Pitts.-Silver Peak	.91
Silver Pick	.11
St. Ives	.30
Tramp Con	.04
Argonaut	2.50
Bunker Hill	‡4.50
Central Eureka	.38
So. Eureka	‡2.90

N. Y. EXCH. Sept. 3

Name of Comp.	Clg.
Amalgamated	86
Am. Agri. Chem	59¼
Am.Sm.&Ref.,com	84⅜
Am. Sm. & Ref., pf.	108¾
Am. Sm. Sec., pf. B	87¾
Anaconda	44¼
Batopilas Min	1⅝
BethlehemSteelpf	72¼
Chino	40
Comstock Tunnel	‡.10⅛
Federal M. & S., pf.	43
Goldfield Con	3¾
GreatNor.,ore.,ctf.	45½
Guggen. Exp	57¾
Homestake	96
Inspiration Con	18¾
Miami Copper	29½
Nat'nalLead,com.	59⅜
National Lead, pf.	107
Nev. Consol	22½
Pittsburg Coal, pf.	96½
Ray Con	21⅞
Republic I&S,com.	27¼
Republic I & S, pf.	88½
SlossSheffi'd,com.	54
Sloss Sheffield, pf.	100
Tennessee Copper	41⅝
Utah Copper	65
U. S. Steel, com	72
U. S. Steel, pf.	113
Va. Car. Chem	45½

BOSTON EXCH. Sept. 3

Name of Comp.	Clg.
Adventure	8⅛
Ahmeek	350
Algomah	5¼
Allouez	47
Am. Zinc	30¾
Ariz. Com., ctfs.	5⅝
Bonanza	‡.40
Boston & Corbin	‡7/16
Butte & Balak	‡3/16
Calumet & Ariz	81½
Calumet & Hecla	545
Centennial	‡22½
Con. Mercur	‡.13
Copper Range	58¾
Daly West	4⅜
East Butte	13½
Franklin	‡11½
Granby	56⅛
Hancock	‡28½
Hedley Gold	‡19⅜
Helvetia	1
Indiana	18
Island Cr'k, com	‡55
Island Cr'k, pfd.	‡91
Isle Royale	35½
Keweenaw	2¾
Lake	35½
La Salle	‡6½
Mass	7⅛
Michigan	‡2½
Mohawk	69⅝
New Arcadian	‡4½
New Idria Quick	‡6⅞
North Butte	33¼
North Lake	5¾
Ojibway	4⅜
Old Dominion	60¼
Osceola	116
Quincy	‡92½
Shannon	16⅝
Shattuck-Ariz	21½
Superior	47
Superior & Bost	‡17/8
Tamarack	43
Trinity	6
Tuolumne	‡21/16
U. S. Smelting	45¼
U. S. Smelt'g, pf.	50
Utah Apex	‡2¼
Utah Con	11¼
Victoria	‡3
Winona	5½
Wolverine	102
Wyandot	‡2

N. Y. CURB Sept. 3

Name of Comp.	Clg.
Barnes King	.88
Beaver Con	.46
Braden Copper	7
B. C. Copper	5
Buffalo Mines	1.25
Caledonia	‡.40
Con. Ariz. Sm	5/8
Davis-Daly	2 7/16
Diam'field-Daisy	7
Ely Con	9/32
Florence	.95
Giroux	5⅜
Gold Hill Con	1/16
Greene Cananea	9⅞
Greenwater	.05
Internat. S. & R.	‡124
Kerr Lake	2⅜
Keystone	2⅛
La Rose	2 1/16
McKinley-Dar-Sa	2
Min. Co. of A. new	3
Motherlode Gold	11/16
Nev. Utah M. & S.	‡.01
Nipissing Mines	8¾
Ohio Copper	13/16
Pacific Sm. & M	3/32
South Live Oak	1¾
South Utah M. & S.	5/8
Standard Oil (Old)	1110
Stand'd Oil of N.J.	412
Stand'd Oil Subs.	‡525
Stewart	1 7/16
Tonopah	7¼
Tonopah Ex	2⅞
Tri-Bullion	⅛
Tularosa	1
Union Mines	‡1/16
United Cop., pfd.	10
Yukon Gold	3⅝

BOSTON CURB Sept. 3

Name of Comp.	Last
Bingham Mines	3/32
Boston Ely	1 1/16
Boswyocolo	.02½
Butte Central	7
Cactus	10
Calaveras	3
Chief Cons	1 13/16
Corbin	.95
Cortez	.99
Crown Reserve	3½
First Nat. Cop	2 3/16
Majestic	.48
Mazatan	‡½
Moneta Porc	‡.05
Nevada-Douglas	3 7/16
New Baltic	2⅜
Oneco	1⅝
Raven Copper	30
Rhode Island Coal	13
San Antonio	‡3
S. W. Miami	5
South Lake	9½
Trethewey	.40
United Verde Ext.	.37
Vulture	‡5

LONDON Sept. 4

Name of Com.	Clg.
Camp Bird	£1 8s 6d
Dolores	1 10 0
El Oro	013 6
Esperanza	1 15 9
Mexico Mines	7 12 6
Oroville	0 5 3
Stratton'sInd.	0 3 1½
Tomboy	1 6 0

‡Last quotation.